FLEXIBLE MANUFACTURING NETWORKS

HEARING

BEFORE THE

SUBCOMMITTEE ON REGULATION AND BUSINESS OPPORTUNITIES

OF THE

COMMITTEE ON SMALL BUSINESS
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FLEXIBLE MANUFACTURING NETWORKS

TUESDAY, SEPTEMBER 13, 1988

HOUSE OF REPRESENTATIVES
SUBCOMMITTEE ON REGULATION AND BUSINESS OPPORTUNITIES,
COMMITTEE ON SMALL BUSINESS,
Washington, DC.

The subcommittee met pursuant to notice at 10:15 a.m. in room 2359-A, Rayburn House Office Building, Hon. Ron Wyden (chairman of the subcommittee) presiding.

Chairman WYDEN. Good morning, the Subcommittee on Regulation and Business Opportunities will come to order. American business is being battered by foreign competition with American manufacturers being hurt worse than other sectors of our economy. Small manufacturers, the providers of most of the manufacturing jobs in this country, are those that are hardest hit.

The subcommittee is convened today to examine ways of saving these vital employers from a life-threatening pressure of relentless international competition.

Specifically, we will examine a promising new remedy involving cooperative business activities, known as flexible manufacturing networks. We intend to examine a number of important areas, specifically, how can we apply this extremely successful European system in U.S. industries?

Second, how can we eliminate irrelevant regulatory restrictions and other obstacles which may bar the full use of manufacturing networks in our country? Here is where the new world can learn something from the old.

Flexible manufacturing networks, allowing small companies to come together for joint research and development, manufacturing, technology transfer, worker training, and marketing, have been in place for 30 years in Italy's machine tooling industry and in Denmark's textile and furniture manufacturing sectors.

It has worked and thousands of jobs have been saved. We are going to hear today that flexible networking can help curb the costly loss of prime U.S. manufacturing jobs that has occurred over the last 8 years. We have seen some 700,000 high paid and high skilled jobs disappear since 1981.

The Reagan administration's sole initiative for increasing exports in recent years has been limited to allowing the value of the dollar to drop. This isn't a policy of industrial renewal. It is a placebo cure, a prescription, in my view, for continuing decline in some of our most important employment sectors.

Not long ago your manufacturing industries were the model for the world. Across the board we produced the best quality goods. We produced them efficiently and at the lowest price. But that leadership began slipping at the end of World War II and in some sectors we have lost the lead altogether.

There are a variety of reasons that range from underinvestment in applied research, to education, to counterproductive Federal tax policy. Last week we learned from the Council on Competitiveness about new findings that we believe tell an important story. Their report, a report by a nonprofit organization of business, labor, and education leaders, cited declining and now paper-thin surplus in the Nation's high technology trade balance.

The sad fact is, and the evidence that we will hear today, is that we are giving away our technology faster than we can produce it, with foreign competitors producing the products from our innovation. We are continuing to lose market share in older bread-and-butter industries like bearings and machine tools and in newer, sunrise sectors like semiconductors.

At the same time we are seeing a growing shortage of engineering talent. Investments and research and development lag far behind Japan and Germany, our two strongest industrial rivals. We don't have a comprehensive Federal policy to address the needs of business for applied science.

We haven't coordinated public policy on federally-sponsored research and development. Two of the key agencies in the field, the National Bureau of Standards, National Science Foundation are cash strapped. Our Federal laboratory network is poorly managed. Our tax policy discourages capital investment.

Antitrust regulations severely limit joint marketing. Moreover, we make it very tough on small manufacturers to compete domestically and internationally against large, foreign industrial consortia. These are tough problems, but the subcommittee doesn't believe them to be insurmountable and our witnesses today are going to help us identify some of the solutions.

Mr. Brusco of Italy will tell us how flexible networks have helped some regions attain a new industrial Renaissance in his country. Anne Lundholt, who works with Danish furniture manufacturing will explain how their systems saved that national industry from extinction.

A number of witnesses include development agency officials and businessmen from six States, who are experimenting with flexible networking. We wish to offer a special welcome to former Governor Raymond P. Shafer of Pennsylvania, a person who has dedicated his public and private live to economic development.

He will tell us about how flexible networking is being used in Meadville, PA, to provide a new foundation of stability for local machining and tooling companies. We are also pleased to welcome a visitor from home, Ed Whitelaw of the Oregon Development Commission.

We will also hear from David Harrison from the University of Washington; Brian Bosworth of the Indiana Economic Development Counsel, both of whom will explain how public-private partnerships can encourage flexible networks around the country. Clinton Grimes will tell us how flexible networking is beginning to be used

among small wood products manufacturers in his part of the West. Robert Friedman of the Corporation for Enterprise Development and C. Robert Hatch of the New Jersey Institute of Technology will tell us of the broader implications of this model for the U.S. small industry. Elizabeth Haas, industrial consultant with the internal firm of McKinsey and Co., will discuss practical applications of this industrial model in the high technology business. Then we will hear from Matthew Coffey of the National Tooling and Machining Association to discuss applications in his industry. Finally, Raymond Kammer, Deputy Director of the National Institute of Standards and Technology will testify concerning the Federal Government's efforts to help small manufacturers become more technologically competent and flexible.

The last point the Chair wants to make is I believe that flexible manufacturing networks are one of the most promising economic developments on the scene today. I happen to think that there are a number of key Federal barriers which we already have identified to try to promote this economic development model, the antitrust problem specifically, as we saw several years ago when we began to examine joint research and development ventures. The antitrust problem can be overwhelming.

Just the possibility, just the specter of an antitrust suit and the major damages can place a chilling effect, a tremendous retardant on the development of this economic development model. So we are we going to look at the antitrust issues and we are going to look at the accounting issues, because there is evidence that they, too, have become a significant obstacle to promoting this economic development approach. Also we will hear today about the tax laws that have impeded this sector.

So there are three Federal policies, specifically, that the Small Business Committee wishes to look at. But I am of the view that these are barriers that can be overcome. Just as we have been able to do that with joint research and development ventures and a number of other economic initiatives, we can do so today with flexible manufacturing networks.

So we welcome our witnesses. I note that our first participants, Professor Brusco, Mr. Hatch, and Ms. Lundholt are all present. I thank you for your patience. I am sorry for the delay. It is the practice of our subcommittee to swear all witnesses before the panel.

Do any of you three have any objection to being sworn as a witness today?

[Witnesses sworn.]

Chairman WYDEN. Thank you all for coming today. Professor Brusco, I know you came a great distance. We are going to make a copy of your prepared remarks a part of the record in their entirety, and I know the human impulse is always to read your statement, and if I could ask you to summarize instead your key views, so that we can have plenty of time for questions, that would be very helpful.

Ms. Lundholt, welcome. Why don't we begin with you? These microphones are some of the most infernal on earth, and you are going to have to get that right in front of you and speak into it. OK?

TESTIMONY OF ANNE BIRGITTE LUNDHOLT, DIRECTOR, DANISH FURNITURE MANUFACTURERS ASSOCIATION, COPENHAGEN, DENMARK

Ms. LUNDHOLT. Mr. Chairman, honored subcommittee, I am glad to be present at this subcommittee hearing today as a witness. I will try to inform you about what we have been doing in Denmark, and I am hopeful that it will help you in your preparation of your further work with small businesses.

When you compare a big country like the United States to a little country like Denmark, it seems strange that you might be able to learn something from a little country, but we might have been forced to do this; and if you are wondering what you are going to do now, we might have been forced to do that at an earlier stage.

As you see in my statement, you can see the entire Danish industry has an average employment of about 50 employees per company. That means that our entire industry is an industry of small businesses. We are a country absolutely without any raw materials, no heavy industry in a traditional sense and in a lot of areas, we are without basic research at all.

Anyway, we have to do things in another way. At the same time we are a member of the European community, and it opens up an industrial environment for a little Danish company, but at the same time it demands that we have to deal with a business world with larger companies without any national protection at all.

Our high production costs are among the largest in the world. I think we are number 2 in labor costs in the entire world. The need for import of raw materials has resulted in a very specialized industry, only survivable by exporting. The Danish market is simply not big enough for the products we are producing in the different sectors.

On the other hand, it means that the import penetration rates in most product categories are so high that most of the big countries could never accept such figures in their own country. I can mention that in the textile industry, and I know you were discussing the textile bill last week, and in the textile industry we have an import penetration of about 80 percent.

The organizations have a long history in Denmark, most of them. I have given two examples in my written statement. That is two different kinds of organizations. One of them, which is a typical example of an organization founded in the last century, was originally only a wage bargaining organization.

But with the increasing demands of having an export from Danish companies early this century, they started up being a service organization to the members also in commercial fields. That is the textile industry which has been founded on that basis.

The furniture industry, or the furniture trade association, has been founded in another way, because the furniture association is mainly an association formed only to provide services to the member companies in the commercial fields.

These organizations—and that is very typical for Danish trade associations—are not only doing services but are also performing, I would say, guidelines trying to help the companies to form net-

works on different levels. In this sense in listening to the American discussion, listening to your discussion here, I think I will just stress out that these networks we have are formed on all levels and it is not a formation of consortia, not forming a single company.

It is networks which are not even a single network. One company can be a part of more networks on different levels and with different items and with different things inside these networks or goals. You might have a fixed network to work inside, but it is in a consortia. They are single companies working on their own.

Some of the services are provided also on different levels. It can be provided so that the organization itself is the network. That means to the companies that are not corporating directly with each other but are corporating through the trade association.

We have different services of that kind. We can mention that we have services in the export field. We have services in the insurance field where we, for example, have a collective insurance for our company, so that they are considered in the insurance world as one company with a low rate and following statement and that means that all the companies have to pay like their big competitors in the insurance fields.

We always help them, not in an economical way, but by credibility and availability of collections and so forth, in those associations. One of the main problems in these small companies is that they are made up by handicraft people. They are made up by people who have professional skill in doing textiles, in making furniture, but they don't have any professional skills in managing a company.

That also means that being a Dane, having a Danish language which is not understandable outside Scandinavia, you need, in the exporting world, to be able to speak another foreign language.

That can be a problem to many of our small co-owners, and that can be a big problem to most of these people who have not been schooled in a long school, who do not have a long education in languages, in economy, and so forth. One of the things we are trying to do in these networks is try to make people cooperate and employ in common as a group, or 10 or 15 companies can in common employ and export, and can employ a manager who is able to speak the language and able to assure the products are sold properly in the market.

The other thing which is very important is trying to make these people form networks, to try to make them think in a strategic way about what they are going to do in the future. They know this is the only thing they shall do, and also to be clear for themselves who they are going to cooperate with, what their needs of a network is. Most of these companies, even they know they have to do it, they don't have the capacity of doing it themselves.

The trade associations help people by doing the strategic planning for different sectors inside the branch and trying to help the companies form their own strategy inside this strategic plan. That also helps them find their own networks afterward.

The main areas in which we have been forming networks is in production which means that you can cooperate about modern technology. You can say that a little company with 20, 30, 40 employees is not able to buy fully modern equipment itself. It can simply not use it 24 hours like it has to be done, so you form a net-

work being a collective buyer of these modern equipments. You can have a collective design which means that you have one design, are designing for more companies but some you are not competing with, but your products fit together when you go into the export markets.

You have, of course, corporation or a network inside the educational field where we are trying to make more skilled workers. We are trying to turn the nonskilled industries into skilled industries because especially in a market being a small company, you really need to have extremely well-skilled people in the companies.

The Danish industry has tried to set this up for years and for the time being it is more actual than ever because in 1992 I am sure you know the internal market is opening and that means that a Danish company has to go out with even more competitive terms than we have had until now.

We relax and say if we work in the same way and if we are able to make our companies cooperate, we can fight the niches in the European market which our companies are going to survive on and we will not be kicked over by the big companies. Thank you.

[Ms. Lundholt's statement may be found in the appendix.]

Chairman WYDEN. Thank you very much. Why don't we go next to you, Professor Brusco.

TESTIMONY OF SEBASTIANO BRUSCO, PROFESSOR OF ECONOMICS, UNIVERSITY OF MODENA, ALSO MEMBER, SCIENTIFIC COMMITTEE OF NOMISMA, BOLOGNA, ITALY

Mr. BRUSCO. I have been asked to comment on the experience of small firms in Italy. I shall try to discuss fairly shortly Italian networks and headings.

To start with, I would say that the basis of a network is given by a number of small firms, maybe 500, 1,000. Most of them could be called mini firms because they have even less than 10 employees, maybe 4 or even 2 employees.

These mini firms give employment to about 60 percent, 70 percent of the total employment of the area. The magnitude, the size of the network including the people who work on small firms, on mini firms, on large firms, and including also the independent workers may reach 10,000, 15,000, 20,000 workers.

Now, in our analysis we include in the network also, not necessarily all firms which work in the same sector, but also some firms which work in nearby sectors. Some districts produce the boxes in which we put the footwear or they work to produce the machine to produce the footwear or the machine to produce the machine tool.

The market in which this network exists is very diversified. There are clothing districts, furniture, jewelry, tiles, machinery, robots, farm equipment, packaging machines, any kind of goods, so that one can't really say that this network has their best plays in a fashion or in consumer goods.

They may work in any sector. One of the main characters of the network or the district, as we call it, is that a great number of the small firms or even the mini firms have access to the final market. This seems to me the key point. In other words, there may be 20

percent or 30 percent of the mini firms with less than 20 employees which produce the final goods and which sells on the final market.

I believe this is what our Mr. Wyden was saying before, when he was saying that in order for the procurement to get to small business, you must have small business producing something. Now, this is what happens in the Italian central district, that the number of small firms produces final goods.

Now, let us pass through the second heading. Ms. Lundholt has stressed the point which seems to me exceedingly important. One must not confuse the relation among these firms as they were a strictly cooperation relation out of goodwill and let us say together because we are somehow friends or of the same territory or of the same area.

The network is a very peculiar blend between competition and cooperation. There is a great deal of competition within the network or within the district, as we call it, and there are many markets, one for each stage of production. There are markets for a metal working district, markets for lathe work, markets for sewing, markets for looming, and all of these markets are very competitive.

But then there is a great deal of cooperation among firms who do different things. And this cooperation makes people work together to reach some particular result without compromising the autonomy and independence of the single small business.

For instance, there may be an agreement to have a central agency doing the bookkeeping for all small firms. The bookkeeping for the small firms of less than 5 or less than 10 employees is a difficult business. They are not able to give work full time to an accountant, and so the bookkeeping is done by someone else, and someone else does the bookkeeping for a number of small firms.

Another way of working together may be to organize a purchasing consortium by which small firms get at the lower priced raw material which they need. Another activity which may be developed in cooperation is purchase of land in which to build the new factories or even the building of the new factories on a single site which may afterwards be cut down to size to give it to single firms.

Another way of working together is some firms getting together to form a loan guarantee consortium which allows a group of small firms to contract credit with the banks in a more effective way. Another thing which may be done together is training of apprentices or of adult people.

Another thing may also be the acquisition of new competence in information, which is different from sector to sector. I would like to give you some examples, but possibly I will give you only one. The idea is that, for instance, the producer of farm equipment in Amelia had some years ago a great deal of trouble in order to get the norms which were necessary, which were to be respected if our farm equipment was to be exported in Germany or in France.

Now, to get the norms which are valued by the different lenders in Germany is difficult. So a group decided that someone was to look after the norm, to collect the norm and to explain them to the single firms. The general things which put all of these very different activities together, is the idea that single firms join together to do something, keeping intact their independence, and trying to get advantage over the factor that they contracted together or that

they do something together. They get information together, they get bargaining with the banks and bargaining with the Government, and I mean they do quite a number of things, retaining their independence. This seems to me the main point. The third heading I wanted to discuss very briefly is the nature of the agencies which are the fulcrum of this cooperation.

Now, our experience is fairly different from the one which is going on in Denmark. I would say that there are at least two ways of setting up this agency. In some cases, this cooperation is organized and finds its own fulcrum in the trade association. This is a case for the bookkeeping; this is a case for the building land; and this is a case for the bargaining with the banks. In other cases, the agency which provides this service and which organizes this service is set up by the regional government, often the municipality, together with the trade association and together with the single entrepreneurs.

So there are very complex ways and a very intricate way of setting up an agency which creates consensus around the initiative, but leaves the Government, at least regional government, ability to intervene and to try to stimulate development in a situation in which the single entrepreneurs or even the trade organization would not be able to intervene and to try to cope with a new need. Thank you.

[Mr. Brusco's statement may be found in the appendix.]

Chairman WYDEN. Professor, thank you very much.

Mr. Hatch?

TESTIMONY OF C. RICHARD HATCH, DIRECTOR, CENTER FOR URBAN REINDUSTRIALIZATION STUDIES, NEW JERSEY INSTITUTE OF TECHNOLOGY, NEWARK, NJ

Mr. HATCH. Chairman Wyden, members of the subcommittee, I have been asked to comment on the advisability of transferring European flexible manufacturing network models to the United States and on the regulatory and other obstacles that must be overcome to accomplish such a goal.

As the networking of firms represents a general solution to the problems faced by small business, efforts to foster the network concept and overcome these obstacles to its adoption are not merely advisable.

They are probably essential. There are nearly 130,000 small manufacturing establishments in the United States. They supply 70 percent of the components used in manufacturing.

They produce a variety of consumer goods. They build, especially the smallest of them, special tools on which United States mass production depends and they employ more than 60 percent of the Nation's blue collar labor force. Like their better known corporate brethren, these small manufacturers are under intense pressure from foreign competitors. A great many have been linked to what are now declining industrial sectors. For them, the growth of imports has led to severe difficulties.

Now, small firm owners may well recognize the need to diversify, to adopt new process technologies or management practices, to ex-

plore new markets here and overseas, but they face formidable hurdles in doing so.

As firm size goes down and the severity of limitations up, access to capital becomes more difficult. There is less and less management depth, no time to experiment with advanced technology, little or no money for research and development, and limited market savvy.

If individual small firms are weak and vulnerable, a network gives them strength. Networks are quite simply cooperative efforts to escape from the limitations of size.

The various network systems found in Europe today are regionally and sectorally specific responses to the special problems and opportunities created by the internationalization of the market and the potentials of computer-based technologies. That cooperative network approach is effective, is indicated by the economic performance of those regions where networks are actually developed. For example, Smaland in Sweden and Baden-Wurrtembert in West Germany, Jutland in Denmark, and Emilia-Romagna in northcentral Italy.

These regions are dissimilar in cultures, legal systems, and political situation and patterns of industrialization, but they have some enviable common characteristics, strong manufacturing sectors, very low unemployment, high wages, growing per capita income, active entrepreneurial climates, substantial export success.

They are also regions in which very small firms in large numbers are the key to present industrial prosperity.

We have been fortunate to have with us this morning representatives of two of these regions, Anne Lundholt, director of the Furniture Manufacturers Association, and Professor Sebastiano Brusco.

I, myself, have been observing the evolution of manufacturing and networks in Europe for some years. I would like to give you one concrete example of a network in action. Through network participation the FSM Co. in Modena, Professor Brusco's city, is able to develop and market advanced robots with a staff of 16.

This tiny firm concentrates on system specification, marketing, and assembly of completed robots. Components including sophisticated hydraulic and electronic controls are both designed and fabricated by cooperating firms in the vicinity.

In all, more than a dozen companies, some larger but most smaller than FSM, contributed to production. Although it appears in the statistics as a very small firm, in fact, FSM coordinates efforts of several hundred workers. Its customers include the largest machine tool manufacturers in Italy.

Its output is shipped around the world. Its success shows the strength of the network of which it is a part. Some early investigations suggested that little firms like FSM might be able to survive only in some special fortuitous niche. Now, it seems clear that they, and I now mean all those small firms in these regions, have into it a production system that fits with the forces that are reshaping manufacturing worldwide, the fragmentation of markets, the proliferation of digital technologies. What are the activities in which manufacturing networks typically engage which differentiate them from ordinary subcontracting and improve their chances of success?

The survey of networks abroad would find firms prospering by doing some or all of the following: One, sharing the cost of business services such as accounting, advertising, or market forecasting. Economic theory tells us that a major advantage of the joint corporation is its ability to achieve serious economies of scale and administration.

Networking permits small firms through cooperating to enjoy similarly low overhead.

Second, foreign purchasing consortia to buy commonly needed materials in bulk at lower prices.

Third, organized loan guarantee cooperatives to improve negotiating power with banks and increase access to capital, a familiar problem for small firms everywhere.

Fourth, the cooperative research agreements to effect new process technologies and to develop new production.

Fifth, they link their complementary manufacturing capabilities in novel ways to produce finished goods. This last case is the manufacturing network in its purest form, but service oriented forms of collaboration are not less important in making it possible for small firms to perform like big ones while retaining their independence and flexibility.

Firms that cooperate through improved mutual competitiveness do not do so by attempting to rig prices or block the introduction of ideas that could benefit consumers. They do not because they can't.

What would happen, I ask you, if a group of small businesses today would attempt to collude in restraint of trade? In all likelihood, their places would be taken probably overnight by other firms. They would be swept aside in the absence of high tariff barriers by competitors from Europe or the Far East, in all likelihood.

There is no longer any useful distinction to be made between the domestic and international markets, as the same players are present in both. In recognition of the importance of manufacturing exports, U.S. industries have been offered antitrust exemptions or overseas operations where they are encouraged to plan complimentary production and common marketing strategies.

There is every reason for the Federal Government to assist in the building of networks here. After all, firms that can't compete at home will hardly be competitive abroad. Cooperation among groups of firms within the 130,000 existing small manufacturing companies in the United States is much more likely to improve competition than restrain it. Individual small firms should show improved performance, higher productivity, and lower costs as the result of network participation.

Working collaboratively in groups, small firms will be able to launch new and better goods and services, increasing consumer choice and well being.

If networks benefit society and improve the small firms' bottom line, why have they not been formed in large numbers here? Let me set to rest the notion that small firm networks are peculiar to Europe and do not fit American traditions.

We must pay close attention to the facts that the network concept has taken strong root in nations as different in culture, politics, and regulatory environments as Sweden, Denmark, Germany, and Italy. As a way of doing business, networks are not a reflection

of local history, but rational responsibilities to international markets.

U.S. entrepreneurs are impeded in the identical global economy. They, too, can learn to cooperate in order to compete.

I believe the basic features of the small firm network system are very much in the American grain. The fundamental obstacle to networking in small business is not cultural and surely not economic.

It is fear, fear of antitrust statutes, fear of litigation, fear of treble damages. We have all seen the lawyer at the table when trade associations meet.

In fact, the question I am asked most frequently when I discuss network advantage with small firms is what about the Justice Department, what about the FTC?

Several steps have been taken in recent years to encourage collaboration in the interest of U.S. manufacturing competitiveness. Among them are the Export Trading Act and the National Cooperative Research and Development Act.

In November 1980, in issuing guidelines for joint research ventures, the Justice Department stated, the greater the number of actual and potential competitors in an industry, the more likely that a joint research project will not restrain competition.

Given the very large number of small manufacturing firms and the importance of helping them protect themselves from foreign competition, I believe legislative action to exempt small manufacturers from antitrust regulations is imperative.

Given the large number of small firms and the rapidity with which networks form and reform in order to address changing markets, Federal efforts must create an exemption program which is both fair and simple.

I would suggest the following principles: Firms wishing to engage in joint service or production activities should be required to file a network plan for review presumably by the Attorney General. In the absence of a negative finding within 60 or perhaps 90 days, network participants should be free to proceed with the assurance that an exemption is theirs so long as their activities and their filed plan coincide.

Production networks should probably not be allowed to aggregate many more than 500 workers. In this way the manufacturing groups that are formed will themselves be small businesses.

Such networks must, of course, be free to enter into arm's length contracts with additional suppliers.

Network plans should have a finite life and 5 years might be a useful maximum. Should member firms wish to continue their common activities, reporting of results and refiling for review would be appropriate.

In conclusion, the features of the network system might well constitute goals for the revitalization of manufacturing in the U.S. small firm sector. These features might be included in the findings sections of a badly needed network manufacturing exemption act of 1989.

Of course, cooperative networks formed by small manufacturing firms will increase flexibility and diversity, decreasing sectoral and regional vulnerability to economic cycles and foreign competition.

They create quality jobs with satisfaction, mobility, high pay, and incentives for skilled developments and common characteristics.

Three, they encourage the modernization and diversification of existing small firms, enhancing competitiveness.

Four, they promote import substitution by strengthening linkages within industrial areas.

Five, they enable small firms to adapt to a market that now demands precision, customization, and combinations of advanced technologies and to the growing insistence on the part of large firms on engineering design capability and inventory management competence.

Through the joint efforts of Government and businesses, industrial networks can be built in the United States. The dynamic regional manufacturing economies that will emerge will have qualities that make them well worth fostering: Flexibility, creative high-wedged jobs, and the economic stability that comes with strong local ties. No matter how great the potential benefits of manufacturing networks, they will not be realized without political will.

This subcommittee of the House of Representatives in holding these hearings on the need for antitrust exemptions for small firm manufacturing networks identified a key impediment to renewed industrial competitiveness.

If I can be of assistance to the members of this Subcommittee on Legislation, the small firms need to regain and maintain competitiveness, I will be most happy to help. Thank you.

[Mr. Hatch's statement may be found in the appendix.]

Chairman WYDEN. Thank you very much, Mr. Hatch, and thank you all for an excellent presentation. You bring a sense of urgency to the subject and, Mr. Hatch, I very much appreciate the landmark work that you have done here.

It has been my sense this morning that we are trying to play catch-up ball. We are, in effect, trying to move quickly, to emulate what has been done in Western Europe and you give us some very good counsel on how to do that.

Let me ask just a few questions for both you, Professor Brusco and you, Ms. Lundholt. The first question that comes to mind is both of you have given us, in effect, a very glowing report, and it very much tracks what I have been told about the European model, as well.

Now, there are dramatic differences between our country and yours, Denmark and Italy. There are cultural differences, there are different relations between labor and management. There is a different economic history. There are different relations even between the two countries.

Why don't we start by having you lay out, Ms. Lundholt and Professor Brusco, what are the common denominators that you see in our country that also are in your countries that would indicate that this could be a success here?

Let us begin with you, Ms. Lundholt.

Ms. LUNDHOLT. Yes; OK. I think having listened, having studied a bit about your structure as well, the main part of it, where you can, what are you calling it, where you can be like the Danish structure is to see it in smaller units, see it on maybe a State basis, seeing it on an industrial structure beyond your structure of big in-

dustries, which means that our model might be used for your small businesses, which surely exist, but which is not very well known outside the United States.

I think when you see from a European angle, you see United States as a representative of the big companies, very big companies, exporting out of United States, but you sure have a lot of small companies who inside the single State, inside a single geographical area could learn something from a European model in trying to cooperate and then be strong enough also to go outside the geographical area.

That is a difficult word for my language. So that I think that you have to break up your structure to try to find the similar structure, break it up, take the part of the small businesses and say inside a little area we are like and there we can learn something from the European experience.

Because if you do that, I think the experience is not so different from the European case.

Chairman WYDEN. I can follow that easily. The thesis would be that our small business sector is not different, not dissimilar from yours, both of them have essentially local roots. What they are doing is tailored to the needs of their area, and yet they have the strength to tap the world markets as well.

Professor Brusco, any common denominators that you would see between Italy and our country that could make this concept go in the United States?

Mr. BRUSCO. There are some common denominators. The first one, of course, is skilled labor. I would say the workers in the States are certainly as skilled as the workers in Italy. I am more and more convinced that after all, people who produce—I mean, the bottom point of producing is people and not other things.

The second common denominator is that even in the States, there are a number of small firms which produce—so they are, in fact, working for the world market. The only difference being that they reach the world market to—I don't see any reason why skilled labor and the small firm which now require the mediation of the large firm may propose themselves on the world market getting to the final product alone on their own force, provided they get to the final market with having their own friends and suppliers.

Chairman WYDEN. Professor, Ms. Lundholt, we know that our world is changing very rapidly. It is a very volatile, very dynamic economy, a global economy we live in. Are these flexible manufacturing networks better able to keep up with change than other economic models?

Ms. LUNDHOLT. No; I don't think that is the answer. It is not the answer that this is better than the rest of it. But I think you have to see it in two ways. If you look at it from the Danish side with a small industry, and you look, for example, at Japanese industry, you will see they have the possibility, or you have in a big American industry as well, the possibility of making high technology production which needs a very big company, which needs a very big market, which needs highly automatized production.

If we should do the same, in a little country, or you do the same inside your small businesses in a central State or in a part of the

United States, you simply have to put all your companies together to try to stick up to this evolution in the world's economy.

We simply cannot go up and compete with a little country like ourselves, we can't compete against the big countries and the big industries which employs altogether nearly almost the same as the Danish industry.

So we have to choose another strategy, say to our companies, if you can't compete with them, you have to find another way of sticking up to the evolution in the world market which means you are not going to compete with the big ones.

You are not going to produce the same things. You are going to form networks. You will perform an evolution which covers the niches which are left when the big ones have taken their part of the cake.

I think this is a way of trying to see the world evolution, to see the economic evolution in another way saying we don't all need to go the same way. We just need to find the right place for us in the new economic order.

Chairman WYDEN. One way of keeping up with change then is to constantly be on the search for the niche?

Ms. LUNDHOLT. Yes.

Chairman WYDEN. Up and coming areas where there are opportunities where people need goods and services?

Ms. LUNDHOLT. To be one step ahead all the time.

Chairman WYDEN. Professor Brusco, did you want to add to that?

Mr. BRUSCO. Well, in my opinion, there is no best way of doing almost anything. In the sense that the same thing—for instance, machine tools, may be produced by huge corporations or may be produced by small firms which in some way or another work together. The two models are not necessarily one better than the other. The point is that each one has advantages and disadvantages. The large model has the disadvantage of being less flexible. But, of course, has the advantage of being more able to go to the market and do the marketing. The core of the idea of networking is to provide the small firm model with some instrument which allows them to compete with the large firm model, keeping their own proper advantage.

Chairman WYDEN. One last question for you, Professor Brusco. One of the things we are particularly concerned about is the ability of small companies to acquire the new technology, manufacturing technology, that they are going to need to survive. Now, as I understand it, you, in Italy, have a combined approach. You allow people to have joint ownership, things of this nature, as a way for small companies to acquire the cutting edge technology, is that correct?

Mr. BRUSCO. The problem of technology which is changing, as it is changing now—we are moving from a culture which was a working culture to a culture which is an electronic culture or a working class culture, is one of the most difficult for a small firm in the sense that small firms change their production culture with great slowness and difficulty.

The reason being that in order to get a small firm to move to a new culture, you have to convince many people and many people have to learn. Whereas in a large firm, you put a few around and then you teach people how to do things.

Of course, this slowness is the other side of the coin because once they have learned, they are creative and have fantasy and imagination whereas the worker of the large firm is a different cut from the worker of the large firm is difficult to preserve fantasy and imagination.

What we believe is that this operation, so difficult, may be done through a special agency which introduces the elements of the new culture into the social structure which is supporting the network.

Chairman WYDEN. But to buy new technology, a couple of companies go in together, isn't that correct?

Mr. BRUSCO. Not necessarily. What they shall do is that they will become members of the center for which they pay a fee and the center will give them periodical review of what is going on, make a demonstration, show technicians to give a talk to them and so on. They won't go together to buy a new machine to share. What is going to happen is common search for information and knowledge and expertise and know-how.

Chairman WYDEN. Let me turn to you, Mr. Hatch. You have been really the guru of this movement in the United States and we very much appreciate your good work.

Where are there flexible manufacturing networks underway in the country today and what is a status report of their efforts?

Mr. HATCH. There are two ways to respond to that. There are networks that existed in this country for some time and have been successful. There were also a series of interesting experiments in a number of States, an effort to introduce this concept to the small firm structure.

Before I answer that question in more detail, I would like to comment on your earlier question about sharing technologies. It is more common in Italy for small firms to assist in the creation of a new small firm which will contain that technology which as a group they need than it is for them to jointly own and manage some new piece of equipment.

But they do see to it in some way that the new piece of expensive technology is brought into the industrial district and made available to them.

I was in the wonderful little metalworking firm of Coxa a couple of months ago. There, in what used to be an office, was a piece of very fancy optical electronic measuring equipment from Turin which I expect only to see at Fiat or General Motors. I immediately said to the fellow who runs the company, how can you use this thing? Why would you make such an investment? "Because everyone in the area knowing that I needed it said, well, if you buy it, we will buy time on it." It is shared in the commercial basis.

Anne Birgitte Lundholt could tell you an interesting story of the furniture manufacturers in the northern city of Farso who, faced with a serious competitive problem and the need to shift their entire style and nature of production, cooperatively built and managed a state-of-the-art robotic lacquering facility.

They share time on it. There are different ways in which these clusters of small firms in European regions see to it that the most advanced technologies are part of their productive system.

On experiments here, before we talk about these things which might exist, it is important to realize networking is common in cer-

tain industries in the United States. In the garment industry in New York, for example, it is a historical phenomenon. It is attributed to its long-term success. The movie industry in the United States, a generation ago was dominated by vertically integrated firms called studies that had stars, cameramen, lots, and tried to own movie theaters until the Federal Government intervened. It is now entirely different. It is based in a number of small specialized companies either in Hollywood or New York City. They group together in special patterr depending upon the nature of the film project.

Once that is completed, they are independent firms once again, probably never to be brought together in that same grouping, but to work in other networks to produce other films at a later date.

It goes on commonly in the United States. Professor Brusco noted this morning riding in the cab that some cab drivers in Washington have a radio system, a cooperative radio network which enables them to compete more effectively with the large fleets, for example. It is a form of networking.

It gets on here, it contributes to the success of small entrepreneurial firms. Efforts to expand the number of networks, the richness of the experience, there are experiments going on now that group the States of Indiana, Ohio, and Michigan.

I think Brian Bosworth in the Independent Economic Development Corporation will tell us later today about some of the things that are being done in those States.

Mike has a letter from the Flint River Project. It will tell us that in some ways it is an outgrowth of the beginnings of that collaborative project in those three States. There is a fascinating private sector network experiment launched in Michigan. The State of Massachusetts has taken the lead in some ways in trying to introduce the network concept in its metalworking and needle trades industries and projects called industrial action programs which do bring firms together on the correct assumption that they have more to learn from one another than from us and are more likely to learn it in the sort of cooperative business network system than they are from the top down from State or university-based agencies.

The States of the Northwest, Oregon, Washington, particularly, from which I returned on Friday, are taking very seriously the possibility of changing the way their State economic development agencies function in order to improve the degree and quality of cooperation among the very large number of small skilled firms in that area.

Chairman WYDEN. Mr. Hatch, what is the difference between the network of firms you saw in Italy and Denmark as compared to, say, the relationship of the members of Mr. Coffey's National Tooling and Machining Association?

Mr. HATCH. Professor Brusco cited the crucial difference. Anne Birgitte Lundholt represents in some ways that crucial difference. That is to say they are organized in more complex ways through trade associations which in the absence of antitrust legislation—which does not exist, by the way, in either of those two nations—there is a need to register monopolies and place them under proper controls as we do with utilities in this country.

No legislation prohibiting cooperation among firms. We have trade associations that provide rich services to firms that have enabled them to perform, as I said, like large firms and enjoy the quality of information about global markets and technologies that is in this country typically reserved to much larger corporate entities.

We have, on the other hand, a series of private mechanisms which enable firms to produce for the final market. That is the key difference. Our small firms are traditionally parts of chains of value added, led by large firms that alone have knowledge of engineering and knowledge of markets.

European small firms—specifically in the regions represented today—have learned how to share information. We think of it as some form of distributed intelligence in which little firms know something about technologies, something about markets, but altogether they know everything that is important about technologies and markets.

The issue is: Can we get them to communicate, can we get them to understand the implementary capabilities that presently exist in industrial districts in this country, can we move them from being suppliers of parts to being manufacturers of final goods with direct connections with the markets?

I say if it can be done in places with cultures and histories as different as Denmark and Italy, it surely can be done here. We must do what we can to make sure it happens.

Chairman WYDEN. Mr. Hatch, it seems that the local governments, particularly of Italy, were involved in trying to set up regional centers to try to promote the activities there, particularly to promote the financing of the 6-page major industry service centers in one region in Italy.

Do you feel the Federal and State governments ought to be creating similar kinds of regional centers in the United States?

Mr. HATCH. Yes and no.

Chairman WYDEN. Some of your friends say yes, some of your friends say no. You are with your friends.

Mr. HATCH. The fact is that regional government plays a very important role in development and support of small firm manufacturing activities in northcentral Italy. The national government in Denmark, a smaller country, plays an important role in the technical training of all its small companies, but they don't lead. They facilitate and follow perceived needs that arise from industry itself. The projects you cite, the six sectoral service centers, for example, grew out of projects and trade associations, projects among groups of firms, for problems perceived by labor unions, fearing that certain industries might collapse and leave workers without employment.

Those trade associations, groups of firms, labor unions, sometimes singly, sometimes together, went to, first, one another and then to regional governments saying this industry in that place needs this knowledge, this service. Government was good enough to respond.

What I am proposing is the same kind of system here. Projects to serve small industries and foster networking, that they be in this country, as in Europe, industry-led and market-driven.

I think Professor Brusco mentioned that sectoral service centers are given seed funding by the public sector, regional government, the equivalent of State government in Italy. But over the long term, they must come under the financial control of their members, the small firms of the particular sector and the particular district. If the firms will not pick up the bill, it is an indication that the service is not really contributing to their competitiveness.

Chairman WYDEN. What is the first step in terms of forming these clusters of existing firms into effective network in the United States? Say you hear about this hearing and you think it sounds terrific. You say I am for this. I want to go out and try to pull together a cluster of existing firms into one of these networks in the United States. What do I do?

Mr. HATCH. Actually, I do say that.

Chairman WYDEN. Good.

Mr. HATCH. All the time.

Chairman WYDEN. How do we do it?

Mr. HATCH. I have identified the crux of the problem as fear of antitrust litigation.

Chairman WYDEN. I am going to get to that.

Mr. HATCH. Firms are not anxious to try this attractive model because of that fear. But it is not the only obstacle to overcome in developing a network regional economy in various parts of the United States.

In addition to fear, we also have lack of knowledge. This is a model widely diffused in some parts of Europe but not well understood or easily observed or seen in the United States. It is difficult to form the first, second, third cooperative flexible manufacturing network, but very easy to form the thousandth or thousandth and first. Then it is a known factor. It becomes simple. We have a difficult road for awhile spreading knowledge, convincing firm owners of the benefits.

When I say we, what really is required is the preparation of specialists whom I identify as brokers who have the ability to bring together small manufacturers around their common problems and opportunities and to help them understand the ways in which cooperation can contribute to their competitiveness.

Brokers have—that function, well, like the trade associations in Italy and Denmark, have three qualities: Legitimacy, knowledge of the industry, and an ability to connect knowledge of the industry to the global market and its particular problems.

Chairman WYDEN. So we have these brokers. In effect, these brokers, because of their legitimacy, start working with the firms that are part of this cluster. I assume they would start expanding subcontracting connections between the firms, have a process for regular lines of communication, joint analysis of production potential, staffing.

These were some of the kinds of basic questions the broker would look at right away?

Mr. HATCH. Very importantly, a good feeling for the way in which the global market is changing, a good idea of what its future shape will be. A broker is most important in teaching firm owners and skilled workers of what will happen so they can slowly but steadily adapt to changing conditions. Really, it is a broker who,

for most small firms, first proposes the possibility of shifting from being a manufacturing service provider to being a producer of goods.

Chairman WYDEN. The last question for you, Mr. Hatch, is—here I am, the chairman of a small business subcommittee. I want to be active in promoting this model which I think has great promise. Let us talk specifically about the ways that we could do that. You mentioned antitrust issues. I share your view that all one needs is just a shred of evidence that antitrust actions are going to cause problems, and that is enough to cool things dramatically.

Do you seek any antitrust area for us to do now for flexible manufacturing, the same kind of thing we did for the R&D initiative? Is that statute a good model for reference to draft the antitrust approach you are talking about for flexible management?

Mr. HATCH. I cited it because I think it does represent an important precedent. Most of the principles I have proposed as the findings for what might eventually be the network manufacturing exemption act are drawn from the concepts in that piece of legislation.

I think probably it would be wise, assuming we are always talking about small firms and reasonably small cluster firms in which there is no possibility of monopoly control of markets or prices, that the exemption be total, as it is in the export trading companies act, and it is not in the cooperative research and development act.

Chairman WYDEN. A kind of safe haven sort of approach?

Mr. HATCH. Exactly.

Chairman WYDEN. A safe haven approach and, in effect, a di minimis exemption. If you are particularly small, there is no way you are going to represent a monopoly and you will make sure you can conduct your business unfettered by the chance lawyers are going to show up?

Mr. HATCH. It is always interesting to think what would happen to a group of small firms which attempted to form a monopoly, that acted as if they had. They wouldn't be with us long.

Chairman WYDEN. Like a small football team deciding to become the Chicago Bears?

Mr. HATCH. Exactly.

Chairman WYDEN. OK. We have the antitrust issue that is relevant. What other areas of Federal policy would you like to see me bundle up into a package?

I gather that accounting changes are necessary in your view as well?

Mr. HATCH. They surely are. It seems to be more practice than legal regulation that is at issue here. It is a question of whether things like soft water, group manufacturing equipment, turn it into a flexible system, can be considered an asset. This is something which must be changed.

Chairman WYDEN. That is a legal definition, though, is it not? The definition of soft water is not an abstract principle?

It is a legal definition in the tax code, I think.

Mr. HATCH. Truly you know better than I about legal definitions.

Chairman WYDEN. Do you wish to see that changed?

Mr. HATCH. This is important. The notion of what constitutes an asset in manufacturing is clearly something which will constantly evolve and which requires continuous review.

Chairman WYDEN. Are there other Federal policy changes that are of importance to you? Tax considerations?

Mr. HATCH. I think we all are sorry that there are no more investment credits, particularly for those technologies which would increase productivity and lower costs and hence enhance competitiveness, particularly for small firms which traditionally have had difficulty with access to capital markets.

There are at least three areas.

Fourth, of course, the importance of the centralization of technology transfer and market information services. The United States Government has rich knowledge of technologies. In fact, it has contributed substantially to the creation of things like computer numerically controlled machinery which is the heart of modern manufacturing. Yet, it knows a great deal about the domestic and international ma ket. Yet that skill, that information, doesn't get down to the small firms where it is needed.

Chairman WYDEN. Why is that? Who is hoarding the nuggets in the Federal Government? Why doesn't it get down to consumers?

Mr. HATCH. It has to do with where that information is stored, where the small firms are. That is to say, it is stored in a few places. The small firms are everywhere in the 50 States. It has to do with the differences in the language spoken by those who manage these information and technology services and the way in which small firm workers deal with similar matters.

It is not impossible to conceive of a system to decentralize this information and make it part of small firm culture across the United States.

Chairman WYDEN. I am still not clear where the problem lies?

Are there agencies that are unnecessarily withholding this information? We can mandate, for example, if that is the only way——

Mr. HATCH. I don't mean to suggest the agency directors don't wish small firms to share this information. They do. But the transaction costs are enormous. We are dealing with something on the order of 130,000 small firms.

The vast majority of them are tiny firms, as are the firms in Italy and Denmark. Firms with 20, 30 workers. They try to communicate directly from some central agency in Bethesda or some similar place with firms diffused over this enormous territory and to understand how to connect the quality of information which is gathered at the top to the perception of the problems at the bottom is nearly impossible.

The problem lies in the transaction costs and the impossibility for those knowledge holders to understand what is going on on the shop floor in Eugene, OR, in a metalcutting shop.

However, if the service had an arm which worked not with individual firms, but with groups of firms, it would greatly reduce the cost of providing that information and resolve the problem of the lack of mutual knowledge which makes the information which exists less than useful to people who have to make decisions in order to compete.

Chairman WYDEN. I think you make a very important point. I think we want to think specifically how to do it. It becomes quite clear to me as I listen to you that the real key is for some way to get this information out, some kind of technology-sharing information so that whether it goes to a State group, such as a State group in Oregon that gets it to Eugene, OR, or through a trade association, we come up with a better way for disseminating information about technology.

I think we are making headway in this area in terms of getting information to small business on procurement opportunities. I mentioned this morning in our State, we now have a Statewide information sharing system for small business to find out about Government bids, which procurement opportunities are available.

My sense is we probably need to see created at the State level some way to, on an ongoing basis, get information from Washington, DC, get information from Federal agencies to these States and then to share the technology with the kind of people you are talking about in Eugene, OR, and other great places.

I don't think I have any further questions, principally because we have so many witnesses we may be here until breakfast time. All of you have been particularly helpful.

I know we are going to want to work with you in the days ahead. I have already begun to think about what Federal initiatives we can pursue to follow up on what you are talking about. My sense is we shouldn't dilly-dally over this Federal antitrust initiative, in particular.

I think my work on the R&D one gives me a decent background of experience to know how to proceed on that.

Unless you have anything further to add, we will excuse you at this time. Thank you for your patience. We will be back in touch with you as we proceed.

Mr. HATCH. Thank you for the opportunity to address the subcommittee.

Chairman WYDEN. Thank you.

Chairman WYDEN. Our next panel is the Hon. Raymond P. Shafer, former Governor, Commonwealth of Pennsylvania; Dr. Ed Whitelaw, professor of economics, University of Oregon; Michael Hasler, president, Efficient Enterprises, Project Management for Flint River, Troy, MI; David Harrison, director, Institute of Public Policy Management, Northwest Policy Center, University of Washington; and Brian Bosworth, president, Indiana Economic Development Counsel, Inc.

Gentlemen, it is the practice of our subcommittee to swear all our witnesses. Do you have any objection to being sworn today?

Please rise and raise your right hands.

[Witnesses sworn.]

Chairman WYDEN. Thank you for your patience and interest. One thing I am going to have to do from this point on is insist on the 5-minute rule. I will make a copy of your prepared statements part of the record in their entirety.

I do need to ask each of you to adhere closely to your verbal presentation to 5 minutes.

Mr. Shafer, welcome, we will begin with you.

TESTIMONY OF THE HON. RAYMOND P. SHAFER, FORMER GOVERNOR, COMMONWEALTH OF PENNSYLVANIA

Mr. SHAFER. Thank you very much, Mr. Chairman.

I appreciate very much the invitation to testify on a subject which I believe is critical to the economic future of our country.

I must say you are very broad-minded in inviting a generalist to testify along with all of these specialists. While I am not an expert on flexible manufacturing, I am a devoted exponent. I think it is very important to the future manufacturing base of the country.

As we all know, the manufacturing sector is facing a significant challenge in adopting management styles and technologies if we are going to stay competitive in the marketplace.

I think this is particularly crucial for our Nation's small- and medium-sized manufacturers which form the second- and third-tier suppliers of components to the major corporations. The loss of this manufacturing base would totally undermine our economy.

I will try to be as brief as possible in summarizing what is in my prepared statement. But I think your committee—and you as chairman of this subcommittee—are to be commended for facing this problem head on.

It is imperative that small- and medium-sized manufacturing firms be able to modernize and adopt modern technologies. The reason: If these second- and third-tier manufacturers are unable to modernize, we will likely face a situation of collapse or serious recession.

In my opinion, there are three major problems faced by the small- and medium-sized firms in modernizing. One, the high capital costs for equipment, venture capital, and software; second, the shortage of adequately trained workers; and third, a needed change in management philosophy.

I would like to briefly address these three problem areas. First, as far as capital is concerned, there are several options available to companies.

While large firms have available sufficient capital to meet new technology, the small firms don't have that luxury. I think the three options a small company has are, one, venture capital. The major problem with that is this: To obtain it one must give up control of the business. That is an option which is not very popular.

The second option is to sell stock and go public. This, too, has the disadvantage of requiring the small businessman who has created and developed his business to dilute his control of that business.

The third, and most often used, of course, is asset financing. This has become much more difficult in recent years due to the loss of the investment tax credit. You were alluding to that in your earlier questions to the previous witnesses.

But nevertheless, this is still the most favorable option which a small company has to modernize. It seems to me then that the Government has a major role in addressing this particular problem. Deleting the investment tax credit for service industries may or may not be justified, but deleting it for the manufacturing industry may be economic suicide.

I think it is very obvious that if a company, and especially a small company, selects equipment to modernize that is so expen-

sive the company is put at risk in purchasing that equipment, that company faces the possibility of bankruptcy and the accompanying tragedy, the loss of jobs.

Now the prospect of supplying the needed work force is not encouraging. As you probably know, we have statistics on the record now that show that we do not have sufficient personnel to man modern technological machines. This is not limited to the work force. Managers themselves do not have an understanding of quality or manufacturing processes. This is in large part due to the third, and in my opinion, the most significant problem confronting manufacturers, namely, a philosophical attitude which resulted from our dominance of the world market following World War II.

Prior thereto, the United States was in world competition and had developed effective statistical process controls to assure quality. We dropped these standards and controls after World War II because we felt they were not necessary. That didn't happen in the case of some of our foreign competitors. In fact, as you know, we exported our wonderful knowledge to other countries and they used it against us in world competition.

Now to address the problems of high capital costs, lack of a trained work force, and the needed change in management philosophy, the U.S. Department of Commerce, Office of Productivity, Technology and Innovation under Dr. Bruce Merrifield, is working to develop this concept of a shared flexible manufacturing facility. This would focus on a network of manufacturing firms, all of which would use these services to their individual advantage.

This is where my home community, Meadville, comes in and where I have a particularly personal interest. In Meadville, within a radius of 80 miles, there are approximately 900 tool and die companies. As they have been hurt by foreign competition, the Meadville Area Chamber of Commerce decided to help them by adopting the concept put forth by Dr. Merrifield and we have formed what is known as the National Institute of Flexible Manufacturing.

It is a nonprofit corporation formed to own, operate, and maintain a facility for the development, teaching, training, and transfer of state-of-the-art manufacturing technologies to manufacturing enterprises, particularly the tool and die companies, in our area.

At one time, we called our community the capital of the tool and die industry in the United States. The NIFM proposes to be a national demonstration of such a shared facility in which companies time share the production capability while at the same time train managers and operators in the use of modern manufacturing technology.

The initial facility will consist of a metalworking machining cell used as a production teaching factory. Then future expansion into the manufacturing of electronic subassemblies, plastic injection molding, and the processing of ceramics and composite materials is planned.

To demonstrate that this factory can be run profitably, local manufacturers will be leasing time on the factory's equipment to produce products they will then sell as they would any of the products produced in their own factories. The demonstration of the equipment provides that company with the familiarization needed

to be able to justify, intelligently and practically, the capital investments needed to modernize.

We have classes devoted to training personnel from chief executive officers to shop employees.

The philosophy of producing quality products by continuing to better the manufacturing process itself will permeate the management and technical instruction at NIFM. It has been a model, I might add, in demonstrating how Federal and State governments can work with the private sector.

We have received a significant amount of support from both the Commonwealth of Pennsylvania and the Federal Government through the U.S. Department of Commerce.

I know that you are aware of this, but I will recite it for the record. Both Pennsylvania and the Economic Development Administration have provided seed monies for NIFM. In providing the manufacturing industry with a source of managers and operators trained on advanced manufacturing equipment operating in a production mode and demonstrating the increases in productivity available before risking large sums of capital, the National Institute of Flexible Manufacturing is one answer to the crucial problems faced by small- and medium-sized manufacturers in the United States.

I want to say, again, and strongly emphasize this fact: The economic well-being of the United States is dependent on the success of our Nation's manufacturing modernization as it is on the political stability which has made our American democracy the greatest Government in history.

All of the Nation's resources need to be mobilized and coordinated in this effort.

Starting now, we must solve the problems of proper Government incentives and effective skills education while we still have time to do so.

[Mr. Shafer's statement may be found in the appendix.]

Chairman WYDEN. Governor, thank you.

Ed, welcome. Good to have you here.

TESTIMONY OF W. ED WHITELAW, PROFESSOR OF ECONOMICS, UNIVERSITY OF OREGON

Mr. WHITELAW. Thank you. The Governor commended you as broad-minded for inviting him as a generalist. So I commend you as narrow-minded for inviting me as a specialist.

Let me move fairly quickly through my remarks and just isolate what, for me, is the element or the benefit that these small firms are trying to enjoy by acting collectively. In the economics jargon, there are some efficiencies or economies of scope and scale that acting individually they are unable to exploit, but acting collectively, they can exploit.

Those benefits can be associated with any number of functions. We have gone through a number of them today. There are capital, and production activities, but the list goes on. It can go through marketing, merchandising, storing, acquiring supplies, and so on.

I think it is almost impossible for us to try to rank or identify exhaustively what all those functions are. Rather, they confine

them, those small groups and those clusters. The industries in Oregon that might benefit from this collective activity—there are some that come to mind immediately. We have mentioned such industry in other States and countries, but there are wood products, software, that kind of thing.

But there are also less obvious examples of industries in which clusters would work together cooperatively and benefit from it. In my statement I listed some, but they can go from essential oils, from mint or caraway, and the research that several groups in Oregon have already undertaken and shared that information so that they can increase their harvest through timing of the extraction.

There are contrasts. There are micro-breweries. There are wineries, and so on. I wanted to emphasize those not because I regard them as more important or more promising for Oregon's economy than, say, secondary softwood products or software, but rather to emphasize that there is not a discrete or limited list. Rather, it is all industry. In fact, all industries in Oregon could probably benefit from and many have already benefited from this kind of cooperative behavior.

So then the question is what role for Government? And especially what role for the Federal Government: Is it simply accelerating a process of learning and acquiring of habits that has already been undertaken? Or is it superimposing some models from elsewhere? I think it is the former, given the way I have stated it, rather than the latter.

And so from my standpoint, I am speaking now in my role as one of those helping to develop an economic strategy for the State, in Governor Goldschmidt's words, I am the policy parent for this effort.

As I have tried to think about how the Federal Government might play a role, what I have done in my remarks is enumerated those potential activities we might benefit from as well as those activities, those networks, or cooperative arrangements that already exist and exist without ever having heard of Denmark or Italy or whatever and yet are benefiting from these kinds of cooperation.

Let me give you a few examples.

There is now, or soon will be, an Oregon software council that derives from a Eugene Software Council that formed a number of years ago, initially informally and then formally, in which several very small software firms got together to share certain resources and facilities that alone they could not afford but collectively could. This idea has evolved into what is now proposed as a Statewide software council to do much the same thing: Sharing of knowledge, in some cases, some equipment, and it is a rather fluid or flexible notion.

It is not a State agency. It is very much a private/public cooperation.

There are several other examples. I have listed them in my statement. The point I wanted to emphasize, rather than get tied down in the details of listing those, is the help would be most beneficial to what we now envision as the strategy, the economic strategy for Oregon if that help exploits existing institutions, existing resources, and existing—whatever you want to call them—networks,

cooperative arrangements, and the like, in Oregon to use the term of one of the other folks, a man named Duncan Wyse who is in the Economic Development Department in Oregon. He said it is more a matter of tweaking those processes and habits we are already acquiring or are developing rather than in introducing new institutions or new aspects of our strategy.

Those are my remarks.

[Mr. Whitelaw's statement may be found in the appendix.]

Chairman WYDEN. Well said.

Mr. Harrison is next.

TESTIMONY OF DAVID HARRISON, DIRECTOR, INSTITUTE OF PUBLIC POLICY MANAGEMENT, NORTHWEST POLICY CENTER, UNIVERSITY OF WASHINGTON

Mr. HARRISON. As you mentioned, Congressman, we are fresh from forums in Minneapolis, Seattle, and Portland on "Lessons from Europe." In particular, we have examined flexible manufacturing networks. I will supply a full report on those forums before the record closes.

[The information was not received.]

Mr. HARRISON. I also want to note I reside in the State that is benefiting from your vision. We are one of the demonstration States on the Unemployment Insurance self-employment project that you initiated years ago. We are already in a position of having benefited from your leadership on so many issues.

As you well know, we are in a position in the Northwest where we have to sharpen nearly every policy tool at our disposal. We can't afford to put a mileage limit on that process.

Many of our major industries are mature. Flexible networks are a part of our quest for new drivers for economic growth. The search for new sources of economic vitality is the theme as both Washington and Oregon carry out major strategic planning efforts in the area of economic development.

We conducted these forums in Portland and Seattle so that small business leaders, economic development officials, and policy makers could look at the appeal of flexible networks. We examined how we could treat flexible networks both as an attractive tool and as a strategic readjustment of existing programs.

We heard some cautions at the forums that are mentioned in my prepared statement. These were particularly oriented toward the possible inadequacy of the base upon which we must build network models. Our participants were concerned about the present orientation of economic development officials toward serving small enterprises one enterprise at a time.

I think you will see increased application in this model. This will be spurred by additional foundation investment in both Oregon and Washington. This will help these States carry out new sub-sectoral research to educate people on flexible network alternatives; to seek out new brokers and other change agents, and to consider challenge grants to various sectors in transforming the way they do business.

I would like in my last minute to help you take a look at what we are building upon. Certainly, we need to have a Federal partner

in this process, more than we have had in recent years, but we have the beginnings of flexible networks underway.

In my prepared statement, I mentioned eight small electronics firms working together in Richland, WA; sheet metal companies in Olympia and in southwestern Washington contributing together to build a training and apprenticeship center; and a kitchen center in Spokane. The center brings you the new products of a network of a dozen or so firms. This has been bringing pickled wheat berry to our neighborhood grocery store.

As Brian Bosworth just mentioned to me, it is about time.

Chairman WYDEN. We are out there waiting for it.

Mr. HARRISON. Congressman, I have to commend pickled wheat berry to you for our next office reception. It is a fine, fine product. I know it has some implications for your district, as well.

Chairman WYDEN. This saves a lot of time. Staff just showed me a question, what do you see as the near-term future of the Northwest pickled wheat berry?

Mr. HARRISON. I will go on record in support.

Chairman WYDEN. We are moving ahead.

Mr. HARRISON. Finally, as Clint Grimes would have pointed out, there are exciting opportunities to use flexible networks to add value to forest products. Made possible by Pacific Power and Light, his Northern Flathead Manufacturing Network is looking not only to build networks of existing companies, but use flexible networking to encourage the formation of additional wood processing companies. That pattern is being repeated throughout the Northwest as small wood products, value-added companies work together to seek international markets.

As northwest policymakers recognize, it is a pattern that can be encouraged further. It is to our greater economic benefit to harvest trees and make processed wood products than it is to ship raw logs. Ultimately, flexible networks become a tool for getting the most jobs out of each 100 million board feet of timber that become available to us.

I commend you—not only for your work as a whole, but for your interest in pickled wheat berry, and for seeking changes in Federal laws to promote flexible networks.

You might want to include in your legislation a look at the present orientation of the Federal economic development infrastructure. You should examine the agencies from Commerce through EDA to SBA, in terms of their interest in and orientation to these concepts.

Thank you. I look forward to the Northwest Policy Center being your partner in this effort.

Chairman WYDEN. Well, thank you very much for an excellent presentation. We will have some questions in a moment.

Mr. Bosworth is our next witness.

TESTIMONY OF BRIAN BOSWORTH, PRESIDENT, INDIANA ECONOMIC DEVELOPMENT COUNCIL, INC.

Mr. BOSWORTH. Thank you, Mr. Chairman.

My written statement tries to offer a framework or context within which we can understand the importance of flexible manu-

facturing networks on a national basis. There is no sense in me repeating that now.

I want to make a couple of points about some particular activity underway in Indiana, and I would like to deal briefly with the issue of antitrust.

The shift of jobs from large-scale establishments to small ones is very much a national phenomenon. There is a rapid decline in the percentage of manufacturing employment in firms of over 1,000, and a rapid increase in firms of under 100. In Indiana, this shift of jobs from large scale plants to small scale plants is taking place at, roughly, twice the national rate.

That, obviously, reflects our branch plant heritage, but it has enormous implications for our economy. It really has profound implications and consequences for our policy.

Flexible manufacturing networks offer us a way of understanding and encouraging the collaborative behavior essential to the small vertically disintegrated companies selling their complex custom-tailored, quality-based product into a highly niched international marketplace.

Those small companies have difficulties sensing changes in markets and difficulty understanding and adapting new technology, and difficulty managing the complex array of administrative requirements that our governments impose, seeking to protect workers, consumers in the environment, to help small companies overcome these barriers, other than by simply trying to be a big company, we have to find ways to let them cooperate and encourage them to collaborate.

We have four projects under way in Indiana, the results of which we would be happy to share with this subcommittee and others over time. We are looking at the current collaborative behavior within the small business dominated plastics industry in the State, examining the potential for further cooperation among literally hundreds of small-scale producers who are working a recreational vehicle customization and manufacturing housing industry in the State.

There has been a remarkable growth of small businesses gathered around large integrated steel mills, the steel industry having the good sense to relocate its major production facilities out of Pennsylvania into Northwest Indiana has occasioned the growth of the small-scale companies and there appears to be great potential for cooperative behavior there.

There is also an interesting, although modest incubator program in Columbus, IN, where large Fortune 500 manufacturing companies, who are down-sizing, or kicking out of the work force skilled workers, going into an incubator, the tenant mix in this incubator is designed and to encourage complimentary behavior among those small companies.

Let me turn to the issue of antitrust, briefly. As a result of conversations with highly qualified attorneys around the country and small business owners, I am convinced that present antitrust law and doctrine can, in fact, be used to show the flexible manufacturing work, as I understand them to operate, are legal within reasonable constraints that are spelled out in my written statement. However, antitrust laws so deeply and successfully permeate the busi-

ness culture that virtually all businesses are nervous about entering into cooperative efforts of any kind with their competitors. Not only have their attorneys warned them about the potential criminal liability that arises, but they are familiar with the risk of the cost of civil litigation as well.

I would like to add my endorsement to those who suggested the model of the national cooperative Research and Development Act as a way to reduce the danger inherent in small business cooperative activity. I would also like to take this opportunity to raise the possibility of State action on this issue. Even without Federal action, the States could implement their own form of antitrust immunity for procompetitive flexible manufacturing networks. Under the State action doctrine, a Federal antitrust law, the State may choose to sanction even blatantly anticompetitive conduct so long as the State makes clear policy choices and engages in some degree of supervision of this conduct.

Under this doctrine, it would be possible for a State to establish a mechanism for approving flexible manufacturing networks subject to appropriate policy criteria. If the States approval were subject to some form of potential administrative or judicial review, it is likely that Federal courts would find the States' approval to satisfy the requirements of the State action doctrine. Providing a complete immunity from any Federal antitrust liability.

Now, clearly, there might be some additional limits on the extent to which a State could extend its authority over conduct outside its own borders, but as long as the State is operating within its constitutional sphere, the State action doctrine offers a mechanism for a State to experiment with antitrust.

Given the creativity and risktaking which characterized State economic programs over the past few years, such State actions seem quite feasible, perhaps even likely.

Thank you for the opportunity to discuss these issues with you.

Chairman WYDEN. Mr. Bosworth, thank you. I will have some questions in a moment.

[Mr. Bosworth's statement may be found in the appendix.]

Mr. Hasler is next.

TESTIMONY OF MICHAEL HASLER, PRESIDENT, EFFICIENT ENTERPRISES, INC., TROY, MI, MANAGEMENT FOR FLINT RIVER PROJECT

Mr. HASLER. Thank you for the opportunity to speak to you.

I am a practitioner, a small business owner, manager, and also I am one of the members of the founding team of the Flint River Project, which is underway to create a network of small manufacturers in the I-75 corridor of Michigan. I am sitting in for Jack Russel today who is director of the modernization service in Ann Arbor, MI.

I give background in my statement about what we are attempting to do in Michigan, what is happening to the small manufacturer based in Michigan, particularly as it relates to the changes in the automotive industry. I also describe the scenario that I think fits in with the Federal level, with the Department of Defense, what they are attempting to do in the procurement philosophy to

help stop the weakening of industrial preparedness in the manufacturing infrastructure.

To move on specifically to the Flint River Project, I would like to describe in a little bit of detail during the time that I have, what it is we are attempting to do. I would start off by mentioning our admission statement which is that the Flint River Project will create a network that enables our partners to become increasingly competitive. The Flint River Project will help our manufacturing partners expand into new project lines and broaden their customer base. This will be accomplished by providing access to marketing services and manufacturing product engineering support through the network coordinator.

The organization is being structured as a research and development limited partnership, taking advantage of a number of different programs through the Department of Commerce, and also taking a look to take advantage of the Cooperative Research Act of 1984.

The general partner in this structure is the Flint River Project, of which I am president. Limited partners consist of both manufacturing limited partners and investment only. The general partner will provide the general engineering and market resources for the network.

These are the resources the small manufacturer needs for growth, but as has been alluded to by a number of our earlier witnesses, simply can't afford it and that tends to be an impediment to growth and access to new markets. The roles of the network are defined.

The general partner or coordinator is responsible for developing new business for the network and coordinating the project through the many stages to completion. The manufacturing partners will be responsible for quoting competitively on their products on their portion of the project, and working as a participating member of the project team brought together by the coordinator.

The competitive advantage that should be enjoyed by the Flint River Project is the same as that experienced by other networks. The network will allow the organization to tailor itself to the needs of a particular project.

I might note that this is slightly a different approach than what you have just heard with the Meadville Project, because rather than looking at equipment flexibility as exists in the Meadville Project, with one central shared facility, a flexible manufacturing equipment, we are looking at achieving flexibility through organizational flexibility. Taking advantage of the existing capital assets, manufacturing skills and underused capacity.

The alternative, as the gentleman from Meadville described, involves a substantial amount of capital equipment and employee recruiting, and so on, and although sound, is just a different approach.

We have some similarities and differences with the Italian model. The similarity is our small manufacturers act in concert to produce goods and assemblies they could not produce individually. We have a coordinator, and that we think is really the significant difference between what you heard described earlier by Professor Brusco and what we are attempting to do. The key reason for that

is that the Italian model has evolved over decades, and as you described earlier, Chairman Wyden, we don't feel we have the time to allow a flexible manufacturing network to evolve.

So to some degree you can say that Flint River Project, I think, is force feeding the network concept on the small manufacturers in the Michigan, I-75 corridor region.

We are intending to seek opportunities in the automotive defense and heavy equipment spare parts market, particularly low volume specialty markets. We are completing an in-depth feasibility study at this time.

We have been supported throughout this endeavor by the State of Michigan, the Michigan Modernization Service, Dr. Jack Russell, and we are presently seeking sources of further start-up funding from the State and from private parties.

The research we have done so far indicates that the community of small manufacturers in the I-75 corridor region of Michigan is quite receptive to the concept and we have begun initially recruiting of potential manufacturing partners.

We feel that the time is right for this concept. Obviously, many others in this room do as well.

I would appreciate any support that the Federal Government could provide for ventures such as ours, new, and in the future. Antitrust is an issue that, as you mentioned, weighs heavily on the minds of potential partners, and that is why restructuring this in R&D, is a limited partnership. That is one way we found that we can form a network and not have to concern ourselves with antitrust.

Thank you for the opportunity, and I am open to any questions you may have.

[Mr. Hasler's statement may be found in the appendix.]

Chairman WYDEN. Thank you. Let me ask a few questions.

Governor Shafer, you talked about the primary mission of NIFM as a teaching factor, essentially, for America's blue-collar workers. It is no secret that this is a key area for training and education.

I wonder whether State and Federal education grants under current laws are available to NIFM?

Mr. SHAFER. I don't know of any that would be applicable to NIFM. But we are exploring that right now, and we are trying to find out, for instance, if there are any under the current laws in both Pennsylvania and in the Federal Government. I don't know of any.

We are attempting to find any such grants that would be helpful. We are exploring some things with the Pennsylvania National Guard. They have educational projects in which they want to train a lot of the individuals who belong to the Guard so that they will have an income as well as be available.

Chairman WYDEN. Our subcommittee would like to pursue this with you, because I definitely picked up when you mentioned your program specifically was a teaching factory. My sense was that those kinds of programs weren't eligible for State and Federal teaching grants and it seems to me they ought to be. We are going to pursue that with you and, if no other point had been made now, and there have been a lot of worthy points, that is indeed a good contribution.

Mr. SHAFER. I think it is one of the most important, because as you know, we don't have enough individuals to service modern technology at the present time. That is why this teaching facility will be helpful to every one of the companies.

We think also you can use a tax incentive for companies sending individuals to it.

Chairman WYDEN. You are a politician and you deal with politicians——

Mr. SHAFER. I am retired. Now I am a statesman.

Chairman WYDEN. I knew that was the case. I wonder, have you seen any problem with politicians being slow to pick up on this? Have they been receptive to this in your discussions with them?

Mr. SHAFER. When they hear about it, they get excited but most of them have not been informed. There is a lack of communication on just exactly what can be done with this particular type of organization. I think that we need an educational effort with our political comrades.

Chairman WYDEN. We are going to try to get the word out. It will be easier because of your good work.

Mr. SHAFER. We had lost so many jobs in our area because of foreign competition. The one example is talent. The birth of the slide fastener industry was in Meadville. When I was Governor, they had over 5,000 jobs in Meadville alone, and that didn't count the other jobs. When it was sold to another company, it was just eliminated, in effect, and there is now a rum company that employs 300. That gives you an idea of what can happen when management itself doesn't take an interest in getting things done.

Chairman WYDEN. Ed, let me turn to you. I want to thank you for both making the trip and for all your good work on this and so many on the issues in the State. This is great to have you here.

The first question I have for you is a policy question that grew out of a conversation with some folks who are associated in Oregon industries, talking about flexible networking.

They said, like many today, that the idea was a promising one and they thought it made a lot of sense. But they were concerned there would be some natural distrust between competitors within the same industry, say in wood products, for example.

Has the State picked up that kind of sense, that one of the limitations to this may be having to break down some barriers of distrust and reluctance to work with people?

Mr. WHITELAW. The answer is, of course, I guess the State has picked that up. But it is very easy to pick it up, from that industry.

Another example that is even more fiercely independent and competitive is the sand and gravel industry, for example. There are a number of cases where habits of decades are for confidentiality, secrecy, and all that kind of stuff. So the approach is almost a therapeutic.

I mean the process, not so much the content of what might be offered, but the process is one of forming these task forces, the committees, and so on, where these folks begin talking about it.

The point that has been made a number of times deserves repeating, if it doesn't come voluntarily from the industry, there is no way that you can impose it. And so, yes, there is that sensitivity there, and I think that in Oregon as well as where people are

coping with it by addressing the issue. Which links to a potentially anticompetitive element in those cooperative arrangements, and I raise this only because I think I can do it in good conscience, because I feel that the overwhelming impact is a procompetitive one and definitely a gain for society and for Oregonians, and so on, but there is an issue that I think was not addressed in the piece that Steve Jenning sent me that you apparently had done, a comment on antitrust.

Chairman WYDEN. Congressional Research Service.

Mr. WHITELAW. Apparently so. It is this notion—usually when people talk about antitrust, they talk in the context of collusive behavior that enhances prices or there is some other—we talk about a pricing and restricting production and so on.

There is this notion of the essential facility that was emphasized in the Clayton Act, and by its nature, some of these cooperative arrangements are meant to exploit the scale economies of an essential facility that is too large for any of them to purchase alone.

It is access to that essential facility, that is very important to the extent that the group can exclude other firms in a small metropolitan area or urban industrial region, it could have anticompetitive effects. I don't think it is an unsolvable problem but it is an issue that is important, I think.

Chairman WYDEN. The only other question, Ed, we really need for the record. I would be derelict unless I asked this. Tell us what you see the potential for wood products in this area? What are the areas with respect to wood products that you think most lend themselves to flexible manufacturing?

Mr. WHITELAW. There are many small, some recently started up, some not so recently started up, secondary wood products firms in Oregon and in the Northwest, that can benefit greatly from cooperative arrangements, these flexible networks, for a number of different functions, both on the supply side, the input side, as well as the market side, the output side, also in production itself, techniques and the like.

Again, I don't think one should try to arrange which among those functions is more important for wood products industry, since for some clusters, functions A, might prevail for some other clusters, functions B, might prevail. I think we should let the market and those firms decide which is important facilitating that process of learning and identifying those, I think, is a role that the Government can play. I think it would be very important.

Chairman WYDEN. That is what the Economic Development Commission is doing in Oregon?

Mr. WHITELAW. Yes; there is a distinction to be made between the commission itself and the effort to develop this economic strategy which is in fact in the economic development department.

Chairman WYDEN. Mr. Harrison, let me turn to you.

You were at the forum in the Northwest. What were the primary concerns people had at that forum? I gather people thought this was promising and important. Was it antitrust, or were there other kinds of issues that they thought particularly warranted focus now?

Mr. HARRISON. In Seattle and Portland, they identified eight or nine action steps. We were encouraged by the intensity of the discussion.

Chairman WYDEN. Can you make that available?

Mr. HARRISON. I will. Before you close the record, we will file a full report on both forums, the action steps within the nature of designing challenge grants, finding action agents and brokers who could deal with selected industries, conducting additional research on property sub-sectors and so forth.

But certainly, by any test of interest and enthusiasm, desire to move forward, that test has been met to find obstacles, that I mentioned earlier, have to do with beyond antitrust, with the institutional structure upon which any of these efforts would be built.

What the capacity of Government, even though it will not be in the leadership role, the capacity of Government in the economic development community to play its appropriate role in fostering flexible networks has not yet been proven.

Chairman WYDEN. Some of these are getting off the ground without any Government role at all. The one in Montana, I gather, is such an example.

Mr. HARRISON. As I understand, the primary sponsor is a utility. There has been a modest governmental role in the various economic development commissions, and there is no question that all over the Northwest, with a modest governmental role there, there is networking behavior.

It is not certainly of the scale as it is or as it needs to be, but we have got to start upon which we can build.

Chairman WYDEN. The only question, and I appreciate your kind words about the self-employment concept with unemployment insurance and the guru of that movement we will hear from in a few minutes. There is no reason why we couldn't, for example, permit people under that model to come together for purposes of forming a flexible manufacturing network, is there?

Mr. HARRISON. The connection can be very attractive, and I don't think we think of these linkages as often as we should.

As you well know, the training community and the economic development community and education community aren't always figuring out how they can work at these initiatives together.

You are right, it is true in terms of welfare reform proposals that can create jobs that are oriented toward self employment and there are some connections between those enterprises and flexible networks.

Chairman WYDEN. Well, you are being too logical. We can't let all that logic break out. We thank you very much for your help.

Mr. HARRISON. Thank you. We look forward to working with you on this subject in the future.

Chairman WYDEN. We will have a Northwest triangle with you and Ed.

Mr. SHAFER. We are in Northwest Pennsylvania. We will belong to that, too.

Chairman WYDEN. Mr. Bosworth, thank you for your fine testimony. I had only a couple of questions.

What is the role of the unions, as you see it? You come from a fairly heavy union State, as does Governor Shafer, but what is the role for the unions in all of this?

Mr. BOSWORTH. I don't know. I don't think the unions know either, particularly the industrial unions.

The craft unions, I think can appreciate the potential of horizontal relationships among small firms, because they have been used to operating that way. The construction industry, for example, is as good an example of a network sector in the United States as you can find.

Richard Hatch indicated it is as good as the film industry. In the industrial unions it is not clear what their role is going to be, and I think it will take a long time for them to sort that out.

Chairman WYDEN. Is there dialogue underway?

Mr. BOSWORTH. There is, and the principal concern of the industrial unions is to try to stem the considerable loss of membership in those unions. As employment shifts from large-scale plants, to small-scale plants, that loss of membership is going to accelerate. I think the unions are going to have a lot of trouble adjusting to that.

Chairman WYDEN. What do you see as the opportunity for several States, in the Midwest with a related industry or similar economic problem combining forces to look at a flexible manufacturing network?

Mr. BOSWORTH. The challenge facing State level economic development activity these days is to stop treating the firm as a discrete entity and start treating the sector in which that firm operates in order to increase consortia collaborative areas. We have to deal with labor market areas and not be occupied with the artificial constraints in those cases of State boundaries.

The whole concept of collaborative behavior among small firms and more aggressive State policy efforts to encourage that requires multi-State cooperation.

Chairman WYDEN. A couple questions for you, Mr. Hasler.

How many high-skilled, quality jobs do you think the Flint River Project is going to create for Michigan?

Mr. HASLER. Well, directly very few in terms of the Flint River Project. What we hope to do is allow the utilization of a resource in terms of capital equipment, a labor force, the other assets, to allow those to be utilized to a better degree than they are now.

For instance, we don't intend to supplant present business for one of our manufacturing partners, but rather to compliment or enhance what they do. We would like to be able to bring to them the additional business that will allow them to fill out their first shift or add a second shift, or meet their justification hurdles for making that investment in some additional plant equipment.

The growth of the business, new business that we bring into the area will really drive the number of jobs up. I would expect that over time it would be substantial. However, I think that as much as anything, it is a retention of the labor force, rather than a real growth.

Chairman WYDEN. As I understand your testimony, and it is very interesting, what you are trying to do is wait the Federal Govern-

ment out. You think the Federal Government is trying to ride the States' coattails on this?

The States are doing the hard work and the Federal Government in terms of lagging on antitrust or lagging on education or lagging on tax policy, basically ought to get going and catch up?

Mr. HASLER. That has been my experience. I have received interest from the Department of Commerce. There has been interest there. There is no real concrete support, per se.

Chairman WYDEN. Let's follow that up, though. It is great that they call up and say, how are you doing? Were they interested in terms of trying to help you become a pilot project or something of that nature?

Mr. HASLER. Not specifically. Although we are testing the waters both at Commerce and Defense on trying to create some sort of pilot project.

Chairman WYDEN. You are trying to talk them into making you a pilot project.

Mr. HASLER. The dialogue is from us to them and not the other way around at this point.

Chairman WYDEN. OK. You all have been very helpful.

We are going to take a 5-minute break at this point.

When we come back, I am going to bring our four remaining witnesses up together: Liz Edersheim; John Lyons; Matthew B. Coffey; and Robert E. Friedman, president of the Corporation for Enterprise Development.

If you all don't have anything further you would like to add, we will excuse you.

Ed, we look forward to working with you at home on those other things. You all have been very patient. We will take a 5-minute break and we will convene to hear from our remaining witnesses.

[Brief recess.]

Chairman WYDEN. The subcommittee will come to order.

Our next panel: Ms. Elizabeth Haas; Ms. Edersheim; Dr. Lyons, you are substituting for Mr. Kammer.

Mr. LYONS. I am.

Chairman WYDEN. You are with the National Institute of Standards and Technology?

Mr. LYONS. Yes, sir. I am director of the National Engineering Laboratory.

Chairman WYDEN. Very good. Matthew B. Coffey, president of the National Tooling and Machining Association; Robert E. Friedman of the Corporation for Enterprise on Development; welcome to you. Do any of you have any objections to being sworn as a witness today?

[Witnesses sworn.]

Chairman WYDEN. Let me again thank you all for your patience and I am going to have to really be rigorous on the 5-minute rule at this point with the amount of activity that is on the floor.

So I do pledge to put all of your prepared statements into the record in their entirety.

If you can summarize your key concerns, that would be very helpful. Why don't we begin with you Ms. Edersheim?

TESTIMONY OF ELIZABETH EDERSHEIM, INDUSTRIAL CONSULTANT, NEW YORK CONSULTING PARTNERS, INC.

Ms. EDERSHEIM. Thank you, Chairman Wyden, and members of the subcommittee. I would like to begin by defining effective networking as I see it.

First and foremost, it gets at the heart of what is making a group of companies uncompetitive, that is, it makes improvements to the cost/value equation.

Second, it is an extended commitment, not just a one-time fix. I believe the issue is not whether, but where and how, to bring networking effectively into the United States.

We heard earlier today about effective networks in Europe. Networking is also used extensively in Japan, where this type of activity is integrated in the culture.

In Japan, the mechanism for networking is the industrial groups, and in many cases, the networking has been very successful. For example, networking has enabled Japanese electronics companies to make greater investments in state-of-the-art components and processes than would have otherwise been possible—or has been possible in the United States.

Consider the small Japanese company involved in manufacturing advanced medical equipment. This company recently purchased a huge quantity—effectively, a controlling position—of a very risky advanced circuit. When asked how they can afford to take such a risk, the equivalent of the CEO replied, quote:

> It was no risk. When technology takes another step, I will pass those chips on to another company in the association, such as a consumer electronics company, that does not need to be utilizing the absolute state of the art. There will be no waste.

The networking concept has not just been applied in Europe and Japan—it also has begun to be applied in the United States. How do we begin to take it further and to which industries?

I believe there are four basic criteria for selecting an industry where this concept makes sense. First, the industry should have a high level of international competition. Second, the industry should be in a state of transition so there are likely to be real opportunities to improve the cost/value equation. The industry should be networking effectively elsewhere in the world—we have seen it work someplace else, and, again, it will likely succeed here. Finally, the industry should be important to the United States. Against these criteria, I do not believe there is a better candidate than the semiconductor industry, including a number of companies that supply equipment to the semiconductor industry.

The United States is losing its competitive position in this industry. Two years ago, U.S. companies held the one, two, and three positions. Today, the top three positions are strongly held by Japanese companies.

Perhaps in response to this situation, some cooperation has begun, but it is not effective. Last week in the *New York Times*, there was an article on Arrow Electronics trying to import semiconductors from Samsung. The U.S. network, rather than working to improve its cost/value equation, stopped Arrow's contract with Samsung by stopping their supply to Arrow themselves until Arrow agreed to change its contract.

In addition to this network, there is a semiconductor consortium in the United States. However, it does not include material and equipment companies, and while it states its objective to facilitate exchange of research, it does not call for collaboration.

Other industries that might be good targets include the machine tool industry, heavy equipment, and even our fragmented commercial banking industry. How can those networks be used here?

There are legal and cultural issues, and we have heard from a number of people suggesting steps for getting around those issues. I have a few more in my documented text.

In closing, I reiterate that the key to the health of the United States is the ability of the U.S. companies to compete in the international market. It is clear to me that in other countries some form of networking has enhanced that ability.

I hope the importance of this tool becomes more recognized here at home and that necessary actions are taken to help ensure that it is effectively legislated in the United States.

[Ms. Edersheim's statement may be found in the appendix.]

Chairman WYDEN. Thank you very much.

We will have questions in a moment.

Dr. Lyons, please proceed.

TESTIMONY OF DR. JOHN W. LYONS, DEPUTY DIRECTOR, NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, U.S. DEPARTMENT OF COMMERCE

Dr. LYONS. Good afternoon. I am John Lyons, director of the National Engineering Laboratory at the National Institute for Standards and Technology, formerly known as the National Bureau of Standards.

I am here today because Mr. Kammer, who was scheduled, was suddenly taken ill last night.

Our topic is manufacturing of discrete parts. The problem is increasing global competition and the rapidly increasing level of technical sophistication in this field. The competitive problem in manufacturing of this type relates to quality, cost, and speed to market.

I would like to call the subcommittee's attention to this report that came out from the National Academy of Engineering, titled, "The Technological Dimensions of International Competitiveness." It is a pretty good distillation of the engineer's view of the problem.

Flexible automation or the use of computer technology for manufacturing has potential to address quality in part, for example, by enhancing the accuracy of machines, to address cost, both by inventory control and by producing fewer rejects, and speed. We can now design a part on a terminal, strike a carriage return, and have the machine tool make the part, assuming only that the metal blanks are available in inventory.

The problem in getting this technology out beyond large corporations comes really in two pieces. One, the slow pace of investment by management of the medium and small companies and second, lack of computer-literate manpower. Both of these subjects have been discussed today.

In our written statement, we discuss some barriers that make it very hard for management of smaller firms to cope with the rapidly changing technical scene.

We also discuss technical issues and we discuss the response at the National Institute of Standards and Technology. In particular, we discuss the automated manufacturing research facility which is intended to represent the flexible automation of the year 2000.

So it is very advanced manufacturing technology, and the essence of it lies entirely in software; computer engineering, if you will.

Now, we have faced for several years the problem of moving our technical findings out of the NIST, out to all kinds of businesses. We have no problem with General Motors and Boeing commercial aircraft.

We have only moderate problems with medium-sized companies like Cincinnati Milicron, but we have an impossible problem with the 100,000 small firms that ultimately can use this technology. It is not just the transaction costs mentioned earlier today. It is physically impossible for any one entity to talk to 100,000 companies.

So we have been looking for intermediaries and new institutional relationships.

The Omnibus Trade Act of 1988 has within it a section called the Technology Competitiveness Act of 1988, which among other things changed the name of the Bureau of Standards and gave us in addition to our traditional responsibilities, four new activities to conduct. The first of the four is to establish and to assist a set of regional centers for the transfer of manufacturing technology.

The function of these centers is to package and deliver NIST and related technology to small- and medium-sized business. Each of the centers would provide information to industry in its region, would have the capability to demonstrate the technology, which means it would have hardware, computers, and software and, by definition, skilled staff. It would have the ability to evaluate the need of local industry for this technology and then to assist with the implementation of the new technology in the individual companies. It also would have the charge to provide training of local manpower.

We are now engaged in the first competition for these centers. We put out a request for proposals in July. The deadline for submission of proposals is September 16.

We will fund three such regional centers this coming year. In fact, I will provide for the subcommittee's information a copy of our information package on the solicitation.

The Trade Act also gave the NIST three other functions that are pertinent. One is to assist State and local technology extension services.

The second is to operate something called the advanced technology program, which is to provide catalytic funding or first year seed funding, in particular to small consortia of businesses and to small businesses to take advantage of emerging technology, finally, to provide and assist Mr. Merrifield's function in the Department of Commerce with setting up a clearinghouse for State technical economic development activities. We are just getting started; the President only signed this legislation 3 or 4 weeks ago.

In regard to the subject of networking, it seems that these programs that we are instructed to carry out work as well in helping an individual company as they would with one of these local networks, and, in fact, the centers called for in this legislation could serve as some of the hubs for the networks.

Thank you, Mr. Chairman.

Chairman WYDEN. I am sorry, I didn't pick up that last part.

Dr. LYONS. The regional centers that I described could equally well serve individual companies or networks of companies. The centers may be thought of as the hubs that have been referred to earlier for networks.

[Mr. Lyons' statement may be found in the appendix.]

Chairman WYDEN. Mr. Coffey, please proceed.

TESTIMONY OF MATTHEW B. COFFEY, PRESIDENT, NATIONAL TOOLING AND MACHINING ASSOCIATION

Mr. COFFEY. Thank you, Mr. Chairman.

I think your hearing today has covered a lot of the points that are in my statement. So what I would like to do is concentrate on two or three areas that I did not think got a lot of attention today.

The antitrust issue, I think we have a pretty good definition of the problem and some possible solutions laid before the subcommittee.

In the area of tax incentives, I think that really there are two areas where you have a problem. One is the investment tax credit, because when you think about this from the perspective of the small businessman, the investment tax credit, basically, was his down payment on new technology. When you took away the investment tax credit, you took away his ability to put the down payment on the piece of equipment he needed to increase his productivity.

The second related issue is the issue of depreciation. When depreciation schedules were reset in the 1986 Tax Act, you, basically, set depreciation schedules on computers at 7 years.

We are seeing computer controls on machine tools which are out of date within the period of 36 months. Which, basically, means that a small manufacturer finds himself in the position of depreciating assets that he has already disposed of, because he can't keep them in his factory and stay competitive.

So there is an anomaly there that because the Ways and Means Committee, I think looked more at the main-frame computers as they did computer controls of productive equipment, we have a real problem.

The problem in the area of ITC, of course, was abuse. That abuse largely fashioned by large corporations, buying investment tax credits to lower their own tax bills, but in classic tradition we threw out the baby with the bath water when we attempted to discipline that practice.

In the area of accounting practices, there are definitional problems in the tax bills, and the software definitions is an excellent one, but there are also other problems. I think one of the big problems is that if I go into a small bank today as a small businessman and ask for a loan for a piece of sophisticated equipment, I am nor-

mally asking for that banker to loan me a quarter of a million dollars. That may be more than my net worth. It is probably more than my asset base, and if I am truly a small company, but more importantly, if I factor that purchase into my current ratio or into any of the ratios currently approved under GAAP standards, I will look like I am headed for bankruptcy so fast, because GAAP standards have absolutely no qualification for productivity.

They do not consider what is going to happen in the future. They only consider whether the asset base is now, and whether that asset base is two times the value of the money I am borrowing.

So you wind up being in a hole from the start, with the present way the accounting system is handled, and all the important ratios a bank would use to judge the financial worth of my company. We have problems there, and we can work with you to try to address some of those.

The other thing in the banking area is if we can't put together a private sector approach to muscling the banks because of the antitrust problem and others, perhaps, we ought to look into some sort of loan guarantee fund for the financing of high technology equipment. Maybe that is a recommendation we should bring to the attention of the banking community for their consideration.

Finally, the problem of information dissemination. It is a major problem for a small company.

Now, consider, if you will, a small metalworking company that you own, and you have three employees, and you spend most of your time selling and marketing, because there isn't anyone else to do that. Your wife probably keeps the books in your firm, and you have your employees, hopefully, on the machines, producing valued added; where is the time to get information from the Federal Government?

If you have ever gotten information from the Federal Government it normally comes in reports of hundreds of pages which a single individual will never be able to digest or use. It also tends to come in macro-economic categories. So that it is not terribly useful as marketing information for the small guy looking for information.

I would like to make the point that, contrary to the impression left on the record, the Federal Government has been helpful. They have not been in a leadership role.

The Defense Department has been trying to start with the Mantech Program and certain other programs that have started down this path of technology innovation.

Bruce Menefield at Commerce has been essential in this process. He has become the ombudsman of flexible manufacturing. EDA has funded the Meadville Project and the Holling Centers, which we heard about from the witness from NBS, all, I think, demonstrate some interest on the part of the Federal Government in promoting this idea. So I think we have some pretty clear direction out of today.

There are lots of things we need to do and there are lots of committees that we need to get involved in this process. I think if we keep the perspective of the small entrepreneur in mind as we go through this process, that the problem that he or she has becomes much clearer than when we look at it from a macro-economic point

of view, and try to say, why aren't these people doing this? This is logical behavior. Why aren't they doing it? They are not doing it because they are afraid and they don't have the resources or the time.

I think the fear in the antitrust area verges on the irrational. We are currently going through the process to certify an export trading company for our membership, and the absolute panic put on was pressed by the Justice Department because they were concerned that we were going to have to share information on our available capacity in order to bid on jobs overseas.

How in the world can I bid if I don't tell somebody how much capacity I have to contribute to the consortium? That is the way the Justice Department approaches the antitrust law, even where there is exemption under the Export Trading Company Act. We have a lot of distance to travel in that area.

Chairman WYDEN. Very well said, Mr. Coffey. I think you have heard me say I am interested in a comprehensive package that would address a lot of concerns that have been brought up today. We are going to look forward to working with you.

[Mr. Coffey's statement may be found in the appendix.]

Bob Friedman, please.

Welcome again. We are here because of your initiative. The start that you have given to a good idea. I look forward to any remarks you would like to make.

TESTIMONY OF ROBERT E. FRIEDMAN, PRESIDENT, THE CORPORATION FOR ENTERPRISE DEVELOPMENT

Mr. FRIEDMAN. Thank you, Mr. Chairman.

Thank you for all the hard work you and your subcommittee staff have done.

I thank you also for the compliment you paid me before. As you know, it is easy to advocate ideas. It is much harder to put them into effect. You put them into effect. For that you have won my continuing admiration and appreciation.

I want to talk about the Federal role in fostering the development of flexible manufacturing networks in this country. But first I want to talk about what I think that experience can teach us.

In many ways I think what it is most helpful in doing is clarifying the competitive challenge we face, the kind of strategies likely to be effective in meeting that challenge, and the way to develop and disseminate those strategies. I draw seven lessons from my brief observation of those networks in Europe.

First, is a lesson of hope. It seems to me the network experience stands for the fact that it is possible for whole regions, even State-sized regions to move up dramatically in income over a relatively short period of time.

In the region of Emilia-Romagna, a region of 4 million people through the use of networks, the region moved from 17th of Haly's 30 regions in per capita income, to second in a matter of 10 years, as wages increased from 90 percent the Italian norm to 125 percent.

What this seems to demonstrate to me is that through micro-economic improvements, through the actions of local communities and

States, it is possible to have a dramatic effect, that indeed, communities can seize control of their own economic destinies.

Second, the way we compete in this global economy is to compete in terms of quality, innovation, timeliness, astute marketing, flexibility. What the networks have done, I think, in Europe is enabled firms to learn how to compete far better on these terms. By competing better on those terms, you allow wages to rise. You increase your profit margins.

When we look at firms in this country that are doing very well, we see the same pattern of competition: The American Business Conference is an association of 100 medium-sized firms that have been growing very rapidly. They represent all sectors of the economy, manufacturing, service, high technology, low technology, real estate, finance. On average, they have increased their earnings from international sales 20 percent a year, every year of the 1980's, and increased their employment 14 percent a year. Use any measure you want; they are meeting the challenge of international competitiveness. Ask them how they are competing and they will give you the litany that I began with.

Third, these improvements occur in small steps. Too often, it seems to me we focus on the big breakthrough—the location of a big plant, a major scientific breakthrough, macro-economic policy that deals in the billions of dollars. Instead, what I think you see in these regions, even what you see in our successful firms, is daily improvement in the way they do business; small steps.

Fourth, the mechanism for taking those small steps is by institutionalizing the communication, the learning among firms. I was impressed when I went through the regions of Denmark and Italy that each firm seemed to know it was competing in the global economy; that it employed the latest technology; that it evolved new ways of working with its employees, so that the line between management and labor was thin indeed.

I think the problem in this country is not what our best firms do. They are as good or better than any in the world. But our general practice lags substantially behind our best practice. Thus, when the National Federation of Independent Business asked its half million members to rank their problems, they ranked as 75th out of 75, exporting; it wasn't a problem because they don't do it. I think that is a big problem for us. We will never develop global standards of competition one by one with these firms.

What the network approach gives us the opportunity to do is to really dramatically improve the general practice in a short period of time by wholesaling and privatizing business services—by getting businesses to learn from each other.

Fifth, this is not a peculiarity of culture. The thing that fuels these networks is that they work in today's economy.

Sixth, the real lesson is entrepreneurship, not size. I think the network experience begins to uncover the myths of small business—that small business only produces poor jobs, that small business only develops inservice industries. It shows us the realities of size and the ways to overcome them. The key issue here is entrepreneurship—combining resources in new ways to add value.

Finally, the networks teach us the importance of developing a culture of widespread blue-collar entrepreneurship, the very kind

of culture you have spearheaded in your Self Employment Opportunities Act. We have to get beyond this notion that an entrepreneur is a white male engineer in his middle 30's starting a high technology venture backed by venture capital. In the network regions of Europe are whole areas dominated by former factory-hands-turned entrepreneurs. In this country, the rate of women's businesses is increasing at three to five times that of men's businesses. It is a tremendous resource.

What the networks have been able to do is make virtually everyone, from technical school students, to employees, to owners—entrepreneurs.

I have three recommendations for what the Federal Government should do. One is remove the antitrust barrier. I would urge you to try to establish in legislation a demilitarized zone—an area of network activity that is permissible. I firmly believe that insofar as antitrust statutes impeded flexible manufacturing networks, they are themselves anticompetitive. I recommend you define as large a field for free activity and cooperation as possible. In addition, I think you need an immunization mechanism, given the deep fear firms have of running afoul the antitrust laws. Firms which want to participate in a network should be able to file a plan with the appropriate Federal agency whereby they become immune from prosecution as long as they follow the plan.

Second, publicize the efforts. Publicize the possibilities here, the nature of the challenge, and use the antitrust legislation as a vehicle for doing that—though, by all means, don't slow it down by doing that.

Third, consider matching grants either by reallocating or earmarking existing Federal resources or spending some new ones. I understand the difficulties of spending new money in this environment. In a way, what we are talking about though is privatizing business services so that in the long run, what you do is allow businesses to help themselves and then Government doesn't have to play that role. All you need do is trigger the effort.

The issue it seems to me is not whether networks develop in this country, but how fast. We lag behind our global competitors. You said it very well in your opening statement. I think there is a limited window of opportunity. How long can we allow our firms not to compete on global standards and think we can catch up? I think it is not long. Thank you, very much.

[Mr. Friedman's statement may be found in the appendix.]

Mr. WYDEN. Bob, thank you for an excellent and succinct testimony. All of you have been excellent. I have a bill up on the floor. I am trying to be three places at once. If you all will indulge us, the staff has remaining questions they would like to ask for the record to flesh out some of the points you have made.

I think this panel has been very good, all across the table, in terms of identifying some specifics for Federal action. So please recognize that this is only due to the hectic nature of the last few days. We are going to work very closely with you.

I am very, very much impressed with this model and would like to pursue a comprehensive package to look at how we could promote what I think Bob Friedman correctly says is one of the most exciting developments in the economic system. We will have the

staff, minority staff, proceed as he chooses to do so and ask remaining questions. We will keep the record open for additional documents. I want to thank all our witnesses.

The staff director, Mr. Jenning, will proceed at this point.

Mr. JENNING. Dr. Lyons, I am going to be referring to Dr. Kammer's statement since that is the only document we have received from your department.

In the statement it is stated that we are losing the battle of productivity to foreign competitors. It was also stated among the major reasons is the failure of small firms to automate to increase productivity, quality, and speed the products to market. What do you believe is the responsibility of the Federal Government to correct this problem? How far does it go?

Mr. LYONS. I can speak mostly from the point of view of my own agency, now the National Institute of Standards and Technology. As far as I know, it is the only Federal laboratory with an assignment directly to help industry. That is our business. In 1901 when the Bureau of Standards was created, the committee said this was, in their opinion, the best way they knew to help American industry and the economy by providing the functions of the then Bureau of Standards.

Our way of operating, however, is to be helpful and not to make decisions for the private sector. We think the onus for correcting the imbalance in the international trade accounts rests with industry. Our role is to provide supporting technology or in some cases generic technology before the technology becomes proprietary. We do this by working in various fields of standards and measurements, reference data, information of various kinds. In the case of flexible automation, we have gone beyond the traditional role because there was a rather substantial gap in the technology. It wasn't being filled.

We were strongly urged by both Congress and GAO, and by the private sector to do what we could. We build this rather elegant facility in Gaithersburg which some of your staff have seen. Our attempt there is to solve some of the generic problems, most particularly the communications and software interface difficulties that arise when you put together a shop piecemeal.

One year you buy a mill, another year you buy a robot, the third year you buy a turning center. Typically you buy those from different manufacturers. They can't talk to each other. Someone has to do something about the interface. I regard all of those as facilitating the private sector's use.

When we realized that was not enough—writing reports was clearly not enough because there was a translation problem and as I said a physical problem of getting out to small business, we began looking for intermediators. We are actually looking for a waterfall, if you will, of technology transfer so we can go from our facilities down to perhaps a dozen or two dozen regional facilities and from then to States to counties to the local business.

That is what we are now about with these new centers as part of that waterfall of cascading technology transfer. We hope that it will help.

Mr. JENNING. Doctor, a member of the subcommittee staff recently visited your automated manufacturing facility in Gaithers-

burg. Could you talk a little bit about and perhaps explain in greater detail the unique relationship that has been developing between the DOD and Commerce in this facility?

Mr. LYONS. Yes, briefly, the facility itself is about $20 million worth of hardware, computers, many tools and the like. Lord knows how much in intellectual investment in the software.

Currently, the Navy is a 50-percent cosponsor of the operating budget. The operating budget is about $12 million a year. The Navy picks up half that bill. Their interest in it is what they call parts on demand. They want to make one of a kind for maintenance purposes. They were after the most flexible manufacturing facility possible so that, rather than storing the hundreds of thousands of parts that the Navy needs, they wanted to be able to store data on computer tape and a few metal blanks and have a flexible machine shop available to spit out whatever part is required. They had a very pressing need and decided to buy in.

Now the business of getting the technology into the Navy is a little more straight forward than into small business. First, you have large defense contractors who are technically sophisticated and able to absorb the technology. Then you have the Navy shipyards themselves.

We are starting this year with one of the shipyards out in San Francisco, submarine maintenance facility at Bear Island so the Navy is not only sponsoring in-house work but pushing very hard on the transfer. It is a very useful relationship.

Mr. JENNING. Again, how are these regional centers for transfer manufacturing technology envisioned? Can you restate the purpose and broad goals?

Mr. LYONS. The concept as spelled out in the Trade Act, and more particularly, I guess, in the reports that go with the Trade Act, is to set up regional centers. By regional, I mean supra State. There will be 12 or so centers which will serve the entire industrial sector of the United States. They go on to point out Texas may be considered a region by itself. Perhaps California. Clearly the idea is more than one region. The notion is to provide funding up to a maximum of $3 million a year, 50 percent—dollar-for-dollar matched by non-Federal sources which may include States, counties, industry, whatever. So that would be a total of $6 million a year for the Federal funding to last 6 years.

So there is a sunset provision. The idea is it will gain its own momentum. These regional centers are in turn to feed the rest of the network of outreach and, in many States, that is a combination of particular centers that are already there, or in some States many centers already there, plus the State extension services which gives us the ability to visit the smallest companies and help them with their own internal evaluation.

As I said in my statement, there is a mixture here of demonstration, training, all sorts of things except research. They are not research centers. The NIST is expected to provide the researching to drive these centers.

Mr. JENNING. Doctor, will these mini centers tend to take on the characteristics of the regional economies which they inhabit?

Mr. LYONS. Yes.

Mr. JENNING. I ask that question for a specific reason. We heard about the experience in Columbia Falls, MT, today with the wood products manufacturing activity going on there. Certainly it was brought up more than once by Ed Whitelaw that particular technological research and data, data gathering for wood products manufacturers, would be helpful to our part of the world. Is there any plan, proposal, or suggestion that one of these centers might fit within the northwestern economy, particularly one that might be helpful to wood products?

Mr. LYONS. The way the request for proposals that we are now operating under is drawn, each proposal is to assess its own market region and describe a process based on technology of interest to that market.

There is also a provision that once up and running, those centers are supposed to share nationally their experience. Presumably, most will be process-related aspects. That is indeed the intent, that they should be, as I indicated, they should address the industrial needs, manufacturing sector of the entire country. We are certainly not going to put three in one State, for example.

We are going to try to address the geographic problems. The short answer to your question is, sure.

Mr. JENNING. Ms. Edersheim, a couple of questions for you. I think at this point the record should show Ms. Edersheim is no longer associated with McKinsey & Company. She is a principal in New York Consultants; is that correct?

Ms. EDERSHEIM. Yes.

Mr. JENNING. You mentioned that two of the major drawbacks to networking in the United Stares are legal and need to to be altered. You mentioned that there are major drawbacks to networking in the United States. One is essentially legal. The other is essentially cultural. I am curious about how you change that cultural environment that may be hampering the kind of cooperative association that we are looking at today?

Ms. EDERSHEIM. I think there are probably two elements to the cultural change that are important. One is a belief it can be done so that it is OK; and the second is really changing the patterns. To make the second happen, I believe that there needs to be a felt need in the industry. That is part of the reason I outlined the particular characteristics in selecting the first couple of industries or regions to be networked. One of which was that intensely international, intensely international competition. I think in that environment, the felt need is there. That is a great facilitator for exchanging culture and forced change.

Mr. JENNING. I understand the networks you visited in Europe and in Japan, in those networks government has long been a major financial supporter in various ways; active in the selection of networks, and in industries to be networked.

Do you think that is an appropriate role for the Federal Government to play in the United States?

Ms. EDERSHEIM. First of all, let me correct you. The first statement—which is on occasion the Government has played an active role. It is not an exclusion and not always needed. I think it is an appropriate role for the United States, I think it is absolutely appropriate for the Government to facilitate and help accelerate the

transition right now. I think there is a very difficult balance the Government needs to take in terms of not interfering in private enterprise; and yet, changing the way U.S. companies compete.

Mr. JENNING. Regarding your recent article applying the lessons of networking to semiconductor companies that concludes the United States has lost its edge in the global market of semiconductors, what effect do you see this having on America's national security? What I am getting at is is this sort of competitive issue we are looking at, also a national security issue?

Ms. EDERSHEIM. Absolutely; I believe the semiconductor industry now is comparable to what the steel industry was in this country in the 1920's. The semiconductor industry itself is only about a $30 billion industry; but over $400 billion of goods and services manufactured in the United States are dependent and are built around that $30 billion industry. Including a number of services and goods relating to national defense.

Mr. JENNING. You also bring up the issue of linkage. You say that the U.S. semiconductor industry lacks proper linkage to be fully successful. Can you explain that?

Ms. EDERSHEIM. The linkages that I am talking about are not just between semiconductor companies, but also with implementary skills in terms of the equipment suppliers and the material suppliers.

I think those are two kinds of industries that are of particular importance to this group. They are by and large dominated by small business and to make the U.S. semiconductor industry effective again will require linking a number of equipment companies together and with the semiconductor companies in designing new processes and integrating what the varying groups are doing.

For example, in Japan the equipment companies were aligned with the companies that made the loader and unloader ends of the process. Loading and unloading is such a simple task; yet when the U.S. semiconductor companies purchase their equipment, they then had to worry about integrating the two, and a fair amount of quality problems arose because the line up wasn't quite right.

Mr. JENNING. Mr. Coffey, I think you touched on this before. For the record, could you explain the importance of the tool and die industry to the overall U.S. infrastructure.

Mr. COFFEY. It is a basic industry. It is one of those where if you want to manufacture anything, no matter what it is, from the microphone in front of me to the glass pitcher to the silverware, to the jacks and cables and outlets and everything else in this room, at some point in that process, a tool or die maker has to make the reverse third dimension image of that product.

That industry has for a long time been a small business industry with over 14,000 companies in the United States. The largest of them has 700 employees. That means you are dealing with almost a fundamental definition of small business. It is much more consistent with the image we have of beauty operators and things like that, service type small businesses.

Its importance is that if you can't find somebody to make the reverse third dimensional image of the missile, you can't build a missile. If you can't find somebody to design the plastic case that the

computer goes in, you are going to sit there with a whole bunch of printed circuits exposed to the open air.

If you can't find someone to design the reverse third dimension image of the computer chip, you will not have the computer chip. It is one of those industries that is a basic kind of cottage industry. It has been around forever. You don't manufacture any kind of any product anyplace in the world without someone in the tool and die industry involved in the process.

In the American tradition it has been very much of a small business industry.

Mr. JENNING. Over the last few years the dollar has declined and we have seen many larger original equipment manufacturers, the people who make big products, do well in overseas markets, increase their exports, their international share and so forth. Many of those people are customers of your folks. Would you say that in general your members have increased their sales, financial strength, activity a pace with those larger customers, or has there been a lag?

Mr. COFFEY. I don't know if we can approach it that way. Let me see if I can define what I think has happened. When the dollar was strong, the large American corporations went offshore to buy cheap labor. They moved plants, facilities offshore in order to do that. What they had to do when they did that was transfer the technology they had in the United States to the less developed economies. In doing that, they created the competitive base which has now come back to threaten the domestic manufacturing base.

We now are in a situation where with the decline in the value of the dollar, a lot of those companies are deciding to come back on shore with their production because the image of the lower dollar and the introduction of technology has started to drive down labor costs in the ultimate product in the United States. In fact, most major corporations now say that they can get their labor costs less than 5 percent of the cost of the end product. If that is true, then there is not a competitive advantage to a less developed country. So technology is going to eventually balance out that problem as long as the exchange rates can be reasonably controlled.

I think we are now in a situation where almost the worst thing that could have happened to technology is the lowering of the dollar. It takes some of the edge off the fear that was generated by the fact that American companies were leaving America to produce the products they were exporting back to America.

But on the other hand, obviously, the lowering of the dollar has obviously improved the economic circumstances of manufacturing in the United States and done it rather dramatically in a rather short period of time. We are starting to see now companies making decisions to go off shore because they have to in order to be able to compete in that market.

Clearly with the European economic community becoming a single country in 1992 it will become a larger market than the U.S. market.—350 million consumers. That says to me American companies now have to go off shore in order to be positioned in that market so they don't get blocked out of it by trade barriers.

There are all kinds of changes going on that are affecting the relationship.

In terms of our industry, we basically maintained market share. We have begun to see from the Japanese in particular that they are—when they brought their transplant automotive companies to the United States, that was step one. They continued to source all their tools, all their dies in Japan. Now they are starting to bring their Japanese suppliers to the United States and establishing them. Our States in their wisdom are giving tax incentives to those suppliers to come from Japan because they think they are going to create jobs in the United States. That hasn't been the record of transplants.

You know, those are all factors that are in the mix right now. I don't think our industry is particularly feeling threatened. I think what we are feeling is that there is a need for some changes to be made in basic laws in the United States to allow us the flexibility to meet that competition head on.

Mr. JENNING. Again, the chairman has indicated he is interested in putting together a comprehensive package, several elements. You touched upon several important issues here and made some suggestions. I wonder if you could again review the three or four main points you think ought to be addressed by the Congress in encouraging flexible manufacturing networks?

Mr. COFFEY. The one hit the hardest by most witnesses today is the antitrust fear. Whether it is a reality or not doesn't matter. It is there. It is a fear. It has to be overcome in some way. The way we have been doing it recently given the newspaper preservation acts and given the export trading company act and the R&D act has been to establish specific exemptions approved by the Justice Department and Commerce Department. That is certainly an approach that could be taken in this case. I think what has to be done in this case is that there has to be some general exemption based on the size of the company, based on industries involved in world competition, whatever. There has to be some standards worked out. We would be willing to try to sort through that very complex issue.

Second, you have the whole area of tax incentives. The investment tax credit, if you really want small businesses to get into the new technology quickly, give them back the down payment on the equipment. That is the investment tax credit. Limit it to productivity equipment. Don't make it for cars and everything under the sun. Make it for productivity equipment, the equipment that actually produces a product. Make it for computer control productivity equipment if you would like. But let's get the definition narrow enough that enough people on Ways and Means are willing to swallow and say yes, we made a mistake when we took away the entire investment tax credit.

I think we have to get Ways and Means also to face up to the problem we created in establishing the new depreciation schedules. We have to have depreciation schedules that represent the true life of the technological equipment.

A computer control on a machine is probably good for 36 months. If you are using it longer than 36 months, it has been replaced by something that is more productive. Yet our tax laws are telling you you can't depreciate that in 3 years. You have to depreciate that

over the life of 7 years at the present time. That is an anticompetitive provision in the tax law.

I think you have to—to the extent you can in the tax law—correct the accounting practices. That includes definitional kinds of things. Is software an asset or is software an expense? It makes a big difference to your bottom line.

It makes a big difference to your current ratios. All those ratios are used by banks to judge your financial worthiness as a corporation.

I think we need to look at the problem of information dissemination. Let me just give you an example of the difficulty. Take the Department of Defense. The Department of Defense supposedly has all the information you need to compete on any part that they have purchased at any time. Trying to get that information is an exercise that is just absolutely unbelievable. It can take you months and yet any RFP that comes out of the Defense Department says you have to respond to a bid within 30 days.

You can't find the information about what the specifications are on that part in 30 days without hiring a data broker. The data broker is a human being who specializes in understanding the information that the Department of Defense has better than the Department of Defense understands the information they have. He charges a very high fee for the purpose of getting specifications on the part that the Defense Department wants made. Yet as a competitor, you can't get that.

The big prime competitor has the advantage because he built a part the first time. He knows the specifics in his own files. Anybody competing from the outside has a very difficult time. We have a real problem with information dissemination in the Federal Government on specifications let alone on other kinds of things like marketing opportunities, that kind of thing around the world.

You know, the Foreign Commercial Service in the Department of Commerce, a wonderful idea, but try to get some information that is actually useful to you in making a sales call. You will spend the better part of your life at a U.S. embassy around the world not getting what you need to make the sales call. It is a frustrating environment for the small business man.

I think clearly we ought to look at the possibility of some sort of loan guarantee provisions in the Banking Act that would give bankers some comfort in dealing with technical equipment.

They don't feel comfortable with it. They don't understand it any better than most average people in the street understand why is it important to have a computer control on a machine tool. People don't even know what a machine tool is. Computer control is something more advanced than the Commodore 64. That is about the extent of the understanding. It is true of bankers as well as the average citizen. We are dealing here with a highly technological area that requires people to have some understanding. I think we need some flexible initiative to accomplish that.

Mr. JENNING. Thank you, Mr. Coffey.

Mr. Friedman, you mentioned that larger U.S. manufacturing firms are at least as good if not better than most of their brethren around the planet. Would you believe that we would have an interest in encouraging and supporting flexible manufacturing networks

among their smaller suppliers in this country? If so, do you see this already happening?

Mr. FRIEDMAN. I said that I thought our best firms, large and small, were as good as any in the world. I don't think all of our large firms qualify and I think many of our small firms do. Chuck Sable talks about what he calls double convergence. I do think there is a new relationship between large firms and small. They need quality suppliers.

Cummins Engine just eliminated 400 purchase parts inspectors around the globe, instead paying a premium for products that were guaranteed. Large firms are increasingly having to rely on the innovation capacities of smaller firms.

So I think there is really an energy here and it is important to both—I think it is very important to see the new competition not as a zero sum game. It is not small firms succeeding at the expense of large. It is a chance to increase our market share worldwide. But even beyond that, it is a chance to really forge new frontiers, really find ways of producing better and differently—more adequately satisfying the needs of worldwide populace.

Mr. COFFEY. If I may add to that, I think we are seeing particularly in the automobile industry almost a force feeding of that linkage and cooperation. General Motors, Chrysler, and Ford have all decided to reduce their entire bases. They are reducing them by giving designated pieces of the car to a single supplier, so that the entire interior or the entire front end or the entire trunk and all the attendant pieces and parts are built by a single supplier. So they are forcing their first tier supplier then to form a network under them to get all those parts into that first tier supplier.

You see a cascading down of responsibility. So for the first time you are seeing the automobile companies put design out of house. That never used to happen. Now you start to see something nearing design out of house by General Motors, Ford, and Chrysler.

Amazing things are going on in that major sector of the economy forced by international competition. What I think it says is that you are going to see a real growth market here for small companies over the next several years as more and more companies do less and less manufacturing as the large entities become specialists in marketing to the world and let the manufacturing occur where they can get it perfect, on time, and at the right price.

Mr. JENNING. Bob, just one final question. Could you add some detail to your suggestion that a matching grant program of some type be organized? Tell us a little bit more about it, what it would do, where the money would come from, and so forth.

Mr. FRIEDMAN. Again it seems to me what we are looking for is ways of accelerating a process and a phenomenon that is already underway. We need to encourage firms to think of ways that they can achieve things by cooperating that they can't achieve alone. I suspect that will take some conversation, some research; it will require that someone begins to develop a deeper knowledge of not only what firms do produce, but what they could produce; that groups of firms are encouraged to identify common problems, common opportunities.

That requires what we call brokers. Someone who has the trust, access, knowledge to work with clusters of firms to identify those

opportunities. One way of getting those brokers to emerge is by offering a seed matching grant. That is I think a grant should never continue beyond a finite amount of time. I think the Government should never pay 100 percent of the cost. States are beginning to consider such programs.

They may come in stages, first, for undertaking the research, undertaking the group exploration of what the possibilities are, later for implementing the action plan that they come up with.

I think probably if the Federal Government were to undertake a matching grant program, I would recommend it be done through the States, that is a match of State matching programs which in turn require a match by the broker, the incipient network of firms. Exactly how you would do that, I don't think it needs to be a complex mechanism, but we will explore—I think we should use the States as laboratories.

They have proved to be very capable laboratories in the field of economic development.

It seems to me the money can come out of existing programs. I do think there is a good argument to be made that a fairly small expenditure in this area could have dramatic impacts.

I think once you get enough models around, network behavior will tend to multiply; but getting enough of those models around and mature enough and clearly successful enough, I think, is worth pushing on a little. I don't want to overemphasize the funding and I do think it is important, given that any funding bill would move slowly, that it not be connected to any antitrust exemption.

Indeed, I am a little concerned by the notion of a comprehensive bill. I think there are lots of things we should do. I agree pretty much with all the suggestions that have been made; but I do fear if you load it all into one package, the package may not get anywhere very soon.

To me this is a race against time.

Mr. JENNING. Thank you. We have no further questions for this panel. Perhaps I should defer to you, Andy. Do you have any questions you would like to add?

[No response.]

Mr. JENNING. In that case, let me convey the sincere thanks of the chairman. He is grateful that so many of you came so far today to speak. Unless there is any further business to be taken care of, I will adjourn the hearing.

Mr. COFFEY. Steve, I would like to add one thing. That is to cite the role of the German Marshall Fund in promoting this concept. I think they have done an excellent job. I wouldn't want the hearing to end without recognizing them.

Mr. JENNING. Let the record show their participation was important in this effort.

Mr. FRIEDMAN. Thank you for all your work in putting these hearings together.

[Whereupon, at 1:55 p.m., the subcommittee was adjourned, subject to the call of the Chair.]

APPENDIX

Møbelfabrikantforeningen

Danish Furniture Manufacturers' Association · Verband Dänischer Möbelfabrikanten

PRESENTATION

ANNE BIRGITTE LUNDHOLT

Born 1952 in Fredericia, Denmark

Graduated as Master of Political Science and Economy from the University of Aarhus, Denmark, in February 1977.

Later this education was supplemented by a business administration and economy degree finished in 1983.

The first job after University was in the Danish Employers' Confederation working with wage bargaining and labour market politics. She bargained mainly on behalf of the iron and metal industries as well as a lot of general industries.

During the last six months of the employment with the Danish Employers she worked in the EEC Commission on behalf of the Danish organization. Here she was employed mainly with youth unemployment, information systems in multinational companies and labour market questions in general. She performed an analysis of the cooperation systems in the companies inside the EEC.

In September 1980 she started in the Federation of Danish Textile Industries now shifting from the labour market side to mainly the commercial side. She was the Danish textile industry's respresentative in 7 European and 2 world organizations in the textile business, was the Danish Industries' observer/lobbyist in the multinational negotiations on the world textile agreement, and she was running the service department in the export field. She built up the services still used in the industrial networks today in the organization.

Since first of June this year she has been the general director of the Danish Furniture Manufacturers' Association, which is an association dealing mainly with design and sale including export and fairs.

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WRITTEN TESTIMONY BY ANNE BIRGITTE LUNDHOLT

HEARING ON THE VALUE OF FLEXIBLE MANUFACTURING NETWORKS

SEPTEMBER 13, 1988.

1.BUSINESS STRUCTURE IN DENMARK

a. Total industry

Like most other places the industry in Denmark is based on small handicraft factories. Contrary to most other bigger countries our industry has kept its structure and has never in general turned into bigger units.

With a few exeptions the entire Danish industry consists of small and medium-sized companies, which can be illustrated by the following figures:

The official figures based on companies with more than 6 employees show the following average employment:

Manufacturing industries, total	57 employees
Food, beverage, and tobacco	92 employees
Textiles, clothing, leather	39 "
Wood, wood products, incl.furniture	33 "
Paper,paperprod.,printing and publ.	41 "
Chemicals, petroleum, plastic	59 "
Non-metallic minerals	47 "
Basic metal industries	82 "
Fabricated metal products,machinery etc	64 "
Other	51 "

b. Industrial environment

The saying "small is beautiful" has always been one of the Danish arguments for not changing the structure of the industry. Recent years' development has made it more and more clear that it will be even more necessary in future to form networks or maybe merge small companies to be able to face the future conditions.

Denmark is a very small country - and we have practically no rawmaterials, no "heavy" indstry in traditional sense, and in a lot of areas we are without basic research at all.

Being a member of the European Community opens up industrial environment for the little Danish company, but at the same time

it means that they have to deal in a business world with much larger companies - without national protection at all.

High production costs and the need for imported rawmaterials have resulted in a very specialized industry only survivable by exporting. The Danish market is simply not big enough for such specialized production.

On the other had it means that the import penetration rates in most product categories are so high that most of the big countries could never accept such figures in their own country.

2. ORGANIZATIONS/ASSOCIATIONS IN DENMARK

Denmark is by tradition a country of organizations. For many years - in fact since last century - the Danish workers as well as the Danish employers, have been organized in formal and national unions/associations.

On the labour side the organizationpercent is more than 90, at the employer level a little less.

From being just wage bargaining organizations more trades have developed commercial associations or have included these questions in the existing organisation. This evolution started already early this century.

The two trades which I shall describe in the following represent the two types just mentioned.

The textile federation has developed its commercial assistance inside an traditional wage bargaining organization, the furniture association is developed with the purpose of rendering assistance for the members in commercial questions.

3. FORMING NETWORKS

The Danish network between small companies has - honestly said - not been formed because the companies wanted the networks in itself, but because they needed them to stay in business.

This fact has created networks in many different fields: technology, export, education, etc. Besides of these direct cooperation items the associations offer range of services to their members, but the function is the same as in the networks between individual companies. The only difference is that the companies communicate with the association, not with other members directly.

The establishment of the more formal networks is often performed through the trade associations. They know the members and their need and they are able to match them in the most efficient way.

The need for networks has grown during the recent years due to the evolution in technology, the incresing need for export, and the need for more skilled workers in the traditional lines of business.

4. THE DANISH FURNITURE MANUFACTURERS' ASSOCIATION

a. Background

The association represents most of the Danish furniture manufacturers in Denmark with a total of 475 members.

The purpose of the organization is to assist the members in sale and marketing. The association is only dealing with trade and perform no wage bargainings. This function is dealt with by a general industrial organization covering several trades.

The medium size of a Danish furniture company is, as shown above, the smallest in the Danish industry. The main part of the company is run by the owner, most often a skilled cabinet worker, who has formed a small business. Most of these small companies are placed in smaller societies, and quite often they are second or third generation companies. The furniture industry has no natural centre in Denmark, but is spread more or less equally all over the country.

b.Services

The following services are maintained by the association:

- political lobby, national and international
- public relations

etc.

Fairs:
The Scandinavian Furniture Fair in Denmark is arranged by the association.
Besides, the association is arranging all Danish participation in fairs abroad, including all practical preparations. For such arrangements the association grants a financial contribution to all participating members.

Creditability informations and debt collections, national and international

Market information: the federation performs and buys international market research, which is available for the members at no costs.

Establishing of export groups and follow-up.

Insurance, collective and individual assistance

Commercial law

Productinformation and sercice to cotumers

Contact to technological institutes etc.

c. Main problems

Most of the Danish furniture manufacturers are more producers than salesmen. They do not have the ability to speak foreign lanuages, and their companies are often too small to employ a total export staff themselves.

This means that to reach the necessary exportability, the producers must either cooperate and employ common staff, commit themselves to a professional export agent, or get the assistance on part-time basis from somewhere else.

In the furniture industry the two solutions mentioned first are the most usual.

With the above services the funiture association is fit to meet these demands. Contrary to the textile association, which I shall describe below, the furniture association has never offered direct daily translation services, but at fairs the staff from the association is ready to assist the member firms.

5. THE FEDERATION OF DANISH TEXTILE MANUFACTURERS

a. Background:

The federation represents most of the Danish textile industry and a large part of the Danish apparel industry. The federation represents app. 300 member firms.

The purpose of the federation is to assist the members in both social and commercial questions. The federation is based on an employers' organization, and has later formed a commercial department.

Like the furniture industry the textile and clothing industry is among the industries of the lovest average size, and the companies in most part of the textile industry are extremely

labour intensive.

The biggest indivudual sector is the knitting industry, and this sector is concentrated in a rather small local area in the middle of Jutland - the mainland. Besides of this textile area most of the industry is concentrated within a limited distance from this centre.

This fact has made a lot of the service firms to the textile-industry move from the capital to this centre, including the association which is the only bigger organisation with full service on both labour and commercial questions situated outside Copenhagen.

Most of these textile companies are run by textile producers, and not by professional management educated people.

b. Services:

The textile federation offers services in the following fields:

-labour law, wage bargaining, working environment
-commercial law
-creditability information and debt collections
-market information service
-formation of export groups etc.
-collective insurance
-translation (paid by hour)
-telex and telefax service (paid by use)
-trade politics - especially important in the textile and clothing area with the multifibre arrangement
-technology - in cooperation with an institute
-education

Contrary to the furniture association the textile federation offers no services in direct fair participation and they do not arrange their own Danish fairs. These functions are maintained by private companies.

c. Main problems

The Danish textile manufacturer has an extremely small home market and is up against a very strong competition. The ability of the single company in the export markets is very limited, and the demand for new technology is very high just to stay in the market.

The cooperation among companies is highly developed in the technological field, where it is common to use the same equipment on a collective basis, to make extensive use of sub-suppliers for functions that either demand an expensive tehchno-

logy, which the individual company cannot use to a full extent, or demand a bigger flexibility in number of staff etc.

With a home-market share of app. 20% and an export rate of app. 80% the textile and clothing industry in Denmark is very dependent on exports. Until now exports have been more or less concentrated to the other nordic countries - more than 60% of the total export are for these countries - but the stagnation on these markets and the strong competition has forced the companies to seek new markets. And here the lack of ability in languages and the demand of profesionalism in these new markets shows a bigger need for efficient network.

6. THE NEED FOR STRATEGIC THINKING

As described above the problems which the typical smaller Danish company is facing are the following:
- low home-market share
- increasing competition
- need for expensive and capital-demanding technology
- need for new export markets
- better skilled workers

The first problem to solve in getting the smaller company to think in a more strategic way and to get into the necessary network is to make the companies think of themselves as associates and not as competitors.

Denmark is a small country with only 5 million inhabitants, and at the same time with an industry operating at a level where the natural market has to be at least 10-20 times as big. Our products are mainly niche products, and even though our companies are very small they do have a large export.

To be able to meet the demands of the future we need to make our companies think in a strategic way. We need to make them choose a direction of products, markets, technology , etc. which fits exactly the individual company, and which they are able to follow.

The main danger is the panic occurring in a small company when a season or a period sale is failing. The danger of the companies beginning to compete on only prices and not the parameters they have chosen in their strategy.

In the associations we have developed our strategic plan for the entire industry, and we are assiting the companies in their work to adapt themselves to this trade planning.

If a company has chosen a strategic plan fitting into the overall planning, the association will supplement by offering special promotion, new collective stands at fairs, etc., which can be of assistance to the individual company.

The most difficult part of this work is not to pursuade the individual owner of a small company of the need to have a strategic plan - but for him to get the ressources to make a plan. The typical smaller company is run by a single owner with a very limited staff. He does not have the necessary staff in the specialized functions, and therefore he needs a great deal of assistance from the organization.

The keywords for a typical small Danish enterprise in the years to come are the following:

Products:

-product development, niches, design, high level of knowledge

Markets:

- market development and maintaining
- diversification

Other market factors:

- higher flexibility
- service to customers

Technology:

- specially fit for small but efficient enterprises

Human ressources:

- education and recruiting

7. THE FUTURE MARKET SITUATION

As mentioned above the international market situation will most likely be more difficult in the coming years. In Europe Denmark is facing the EEC internal market from 1992 meaning that from that year the Danish company will have to compete with all EEC companies on equal level. On the other hand it also opens up the a homemarket of a total of 320 million people instead of 5 million people for the Danish company.

The oversea markets have suffered a lot due to the fluctuation of the dollar rate. After a few "golden years" for Danish export to e.g. USA the drop of the dollar has caused severe problems to

a lot of Danish companies. These problems might not have hit as heavily as they did if the companies had been thinking more strategically. Everybody knew that the extremely high dollar rate was not a stable condition we could count on for ever in future.

The fall has resulted in one good thing: the Danish companies are now more avare that a planning for the future and a more stable evolution is needed if they are to survive on the future markets.

8. THE TECHNOLOGICAL SITUATION

The need for new technologies demands especially a new thinking for our small companies. The evolution against more and more automatic production combined with more and more expensive technology fit for massproduction is a danger to small companies in small countries.

The solution for small companies is to cooperate in the purchase and use of the most expensive part of the equipment and to participate in the development of special equipment for small companies which can compete with the bigger companies in the field, chosen by the company in their strategic planning.

In Denmark we have seen a lot of examples of cooperation in this direction. Propably inspired by the very special Danish tradition for cooperatives - non-socialistic - more companies have arranged joint purchases of new expensive equipment - on e.g. a shareholder basis.

The special advantage of Danish companies in this field is the limited distances. Most of the industry in certain sectors are concentrated in small geographical areas - and after all, even as a whole Denmark is not bigger than the entire country can be seen as a concentrated area for production.

9. MAINPROBLEMS ARISING AROUND THE NETWORKS

9.a. The loss of the networks.

The loss of the networks, even the most informal of them, would be extremely dangerous for the companies. It would probably mean that most of the smaller companies would either close down or be a part of a bigger concern.

It will take many years to lift the small traditional handicraft companies to a status where they are able to stay in the market under the new and demanding conditions.

Already today - and this evolution is very new in Denmark - we see a clear tendency towards bigger companies. But it is my true opinion that we will always have a basis of small enterprises in Denmark. Especially if we manage to give them the needed assistance within the networks.

The networks have been absolutely one of the most important factors within a lot of the Danish sectors: agriculture is the best and oldest example, but also textile and furniture are important exampels.

9.b. Antitrust and monopoly:

The network has until now been formed in a way within the industry where monopoly questions have never been any problem. One of the reasons is that we are still operating with individual companies and that the networks therefore never turn into more fixed cooperations raising problems around monopoly etc.

Within the agriculture sector these questions have been raised from time to time. On the other hand there has always been a heavy competition between the different networks in the agricultural sector resulting in monopoly never coming into question.

In the Danish industrial sector these networks have never been able to dominate any markets. The very small Danish home markets combined with the niches we operate in on the international markets set automatically a limitation to the market influence.

Even when they work together in networks, our small companies are so small on the international scale that altogether they can only be seen as a medium-sized company in the market.

9.c. Special benefits

It is obvious that the kind of companies within the associations which can benefit mostly from the networks are those working in the same part of the line of business - those with the same products or with matching products. Moreover, companies which are a little bigger than the smalles ones and have their own professional staff can of course benefit from the export cooperation, but not of the more practical assistance offered. Therefore, this special practical assistance is offered only on a pay-basis.

9.b. Suspicion.

At the beginning of the formation of networks we find a natural suspicion. The companies will all say that the idea is good, but when it comes to the practical part, some of the companies are more suspicious than others.

One of our advantages in this field is that a lot of the companies are situated in smaller communities, and their colleagues within the same line are also their friends. This is a great help when it comes to the final formation.

In the common work done by the association we force the members to cooperate by having e.g. joint stands etc. at fairs, and normally the suspicion dissapears when they realize that their neighbour's customer can be your costumer at the same time, and that this is an advantage and not a competition. The smaller Danish company is beginning to learn that a cooperation in a formal or an informal network is a necessity - not a danger.

BEFORE THE

SUBCOMMITTEE ON REGULATION AND BUSINESS OPPORTUNITIES

OF THE

HOUSE SMALL BUSINESS COMMITTEE

STATEMENT

OF

DR. SEBASTIANO BRUSCO

PROFESSOR OF ECONOMICS

MEMBER, SCIENTIFIC COMMITTEE OF NOMISMA

BOLOGNA, ITALY

SEPTEMBER 13, 1988
WASHINGTON, D.C.

Possibly the best way to start is to say that there is a crucial condition, if what I am going to say is to make some sense: namely that there is no technologically determined best way of producing a given good. In other words, I am convinced that, in one way or another, the political system and also the features of the local community play a major role in shaping the industrial structure. If this is true, different productive systems can produce the same thing and compete on the same market, each of them having advantages and disadvantages. Within this assumption, my talk intends to examine a peculiar system of production, which, remembering many passages of Marshall's Principles, will be called "industrial district".

The first point to stress is that the industrial district is a system which does not consist of a single firm, but which is built up by

a number of firms, I mean hundreds, which work to produce the same product on a small area. It often happens that these firms are classified by statisticians in different industries or sectors. If I think of footwear, the system of production I am describing includes the people who produce the shoes, but also the people who produce the boxes for packaging the shoes, who would be classified as paper industry; or the people who produce the machinery to produce the shoes, who would be classified as metalworking; or the people who print the dépliant of the footwear producing firms who would be be classified as printers; or the people who put the glue into boxes who would be classified as belonging to the chemical industry. In fact, all these people are pieces of a vertical integrated sector. To the eyes of the statistician and to the economists, all ~~these~~ connections disappear completely. The people working in different sectors appear simply as different: it does not appear in any way that those chemicals or those printers are producing for the footwear. So the first difference between the usual way of looking at a productive system and the way I am adopting is this: that I look not at the industry

but at the vertically integrated sector.

Then there is still another difference, and that is that, contrarywise to what is often done, in our analysis the territorial aspect is of primary importance.

Which kinds of firms are in an industrial district? There are mini-firms (I have come to describe these firms as "mini" because when I say "small", you think of a firm with 200 employees) with 10 employees or even 4 or 2 employees. These firms are very numerous and I would say on the whole 50% - or even 60% - of the labour force works in them. Then there are some small firms and there are also some big firms, I mean having 500 workers. But looking at the single firm would be misleading. I would say that the best way of looking at this system of production, which may be referred to as an industrial district, is to take account of all the people in the area who work to produce the final product for the vertically integrated sector. The district, in most cases, has at least 10,000 or 15,000 workers working in it. In some areas, it may be even bigger. So what we are looking at is 15 or 20,000 workers, dependent or independent workers, who work in a

number of firms, maybe 1.000, 2.000, 3.000 firms in a very small area, all of whom work for one final market.

And may be useful, in passing, to note that the markets in which industrial districts operate are very diversified. Some districts produce fashion goods: clothing, knitwear, footwear. Some produce goods in which design is a very strong competitive factor: furniture, jewelry, tiles. But there are also many districts which produce metal tool machinery, robots, farm equipment, oleodinamic equipment, packaging machines, ando so on.

Another important feature of the district is that many of the minifirms have immediate connection with the market of the final product. In the most developed district, you could find something like 30% of the minifirms which produce their own product, and which sell their own product on the world market without any intermediaries other than the retailers.

On the other hand, the other 70% of the firms work on a phase, on a stage of production, and inside them they perform only one stage of production or few stages of production. You can think of someone doing the lathe work, of someone

doing the looming for the knitwear, or someone doing the designing, or someone doing the sewing, or someone doing the carpentry. So that the production process is somehow "exploded" into the various stages of production, into various phases, and there is one group of firms for each phase. All the firms work together to produce the final product. The firms which are responsible for the final product subcontract some stages of the productive process to the phase firms, choosing the level of vertical integration which they think best for them.

Which are the relations among all these firms? They are often described in terms of networking, co-operation, trust, mutual assistance. These firms are told to collaborate with each other strongly instead of fighting with each other. But I think that this point, which is the central ideal of networking, or of the industrial district, must be examined more closely, not to run into deep misunderstandings. What I am saying is that the model which interprets the working of the industrial district is a model which, first of all, must be based on competition. There are many competitive markets -

the market for lathe work, the market for sewing, the market for looming, as I was saying before - and each one of them is a competitive market. These firms strongly compete with each other: the firms which produces lathework strongly compete with each other in terms of prices, in terms of quality, precision in delivery time, in terms of shortening the time between order and delivery. This competition is very strong and very bitter. And there is not any kind of agreement between the firms which perform the same kind of work (I mean the same phase of production: lathe, loom, sew, ando so on), nor among the firms which produce the same components, or the same final product. There is no agreement on not cutting price, on one firm not underselling the other. That agreement simply would not work, and there is no one who tries to do it. And - I think this is very important point to make - there are very few cases of consortia to sell the product of the firms. We are not talking about people who set to work together and to go to the market together.

The places and the ways in which these firms co-operate with each other are different and it is of great interest to describe them.

The first thing is that the amount of fraude and the amount of cheating you find among these firms is very low. And the reason why it is so is that all the transactions are somehow ruled by community rules, by community statutes which are enforced by the fact that anyone who cheats too much or who makes frauds too often will be excluded by the business community. The economic activity is regulated not by laws and codes but by rules which are more deeply embedded in the business community. There is a kind of consensus among the members of the community which enforces a rule which is different from the law, though not in opposition with it. This happens in exactly the same way (and I would say that this is important to keep in mind) in which people who bought and sold cows or bulls or horses fifty years ago used to shake hands to seal a contract. That was the proper way of doing business. Of course, all the lawyers were kept out: which was, it seems to me, a very good thing. And the rules of the community were more clear, more defined, more easily applicable than the rules which derive from the law or from the record of past cases.

There are other ways of working together.

The most important of these is that the final-product-firm, when it needs something, let us say a component for its product, very often does not work out a detailed blueprint and look for the subcontractor who will produce it at the lowest price. In the districts, more frequently, the final-product-firm goes and discusses with the component producer the best way of designing and producing the component. What happens is that he goes there and says, "I need a component of this kind, to performs this task on the machine I am designing. What do you think of producing it in this way?". And the other says: "Why don't we use something which I have done a week ago to make something similar, which would be easily adaptable? Or ..., we could use a standard component which may be found at the retailer shop, or, anyway, if we are to produce it, let us modify yours sketch this way, because in this way the part you need for your machine may be produced at a lower price". At the end of all this complicated process what comes out is that the cost of production of the component is lower than would have been without this cooperation.

What we are in front of - and I would like to

stress this - is not working together and collaboration and co-operation out of good mind or out of concern for the progress of humanity, or for the progress of the Italian economy. There is a search for profit which is made easier by the fact that the firms obey rules which are more easily applicable than the rules of the code, and this makes the cost of transaction very low; the firms are prepared to help each other to decrease their costs of production. I hate people who think that the Italians are easy-going people who like working together. What is true is that within the districts there is in most cases strong competition, but there is also a great deal of working together: and these cases are most frequent among firms which are customer of each other.

It must be stressed that, in this area, as important as this interaction between the working of the community and the working of the economy is the role of the local authority and of the regional authority. Now, talking about policy, the question aries: how do we keep this situation going? The systems of production we have called industrial districts do not necessarily enjoy

success. There are some districts in which activity slows down, and which go out of the market. There are other districts which are able to remain competitive on the world market. What is the role of the public sector in governing this structure of production, and how a cluster of firms, a number of firms which work on a small area, all belonging to the same industry, or to the same vertically integrated sector, may be transformed into something which is similar to a district and which will work as an industrial district? This is the policy problem.

I would certainly stress the need for financial measures, technical training, managerial training and so on. But I do not want to talk about these points. Many people know a great deal about these matters, more than I do. So I want to concentrate on what we call the real services. The idea of real services - as opposed to financial services - is to offer the firm what they need, so to say, in kind: in the same way as the sharecroppers were given not money, but wheat, barley or even beer, you do not give the firms the money to buy something, but give them the real thing. Let me make a short list of services, real

services, in order to understand what I am talking about. A service could be to run an office which collects all the norms about farm equipment in all the different regions of Germany, in France, in the UK, in Italy or anywhere. So when an entrepreneur wants to build a cart to be hauled by a tractor, he goes there and asks: must the wheel have a minimum diameter in order to be conform to Bavarian specifications? And he is told that in Bavaria till yesterday, the wheels were to be from 30 cm to 40 cm large, but now they must be from 35 cm to 45 cm (the ever changing specifications, of course, are a form of non-tariff protection: and the agency which provide the service helps to get over it). What you are giving the firms, in this case, is simply information about the norms. Now this is something which is very difficult to find, and it is different if you give the thing, or the money to buy the thing. Another example is that of giving help in running for a tender. Let us imagine that Nigeria offers a tender for some tractors, some pipelines, and some pesticide spreaders. The small firm reads about the tender in the specialized press. But how is the entrepreneur to get the text of the tender, how

can he get a good translation, how is to get inside information about the competitive factors which are important in Nigeria? You can set up an agency, in which there is a good technician, who is able to ring a friend, or a friend of a friend, in Lagos, and get the pieces of information which are needed viva voce o by telefax. Another service, and a fairly easy one to organize, would be to buy the magazines which are produced by the fashion institutes throughout the world and to make them available to the firms in the district. There are approximately 6 or 10 of these magazines. They go out 18 months before the season and give first hand informations about fashion trends. They are fairly easy to get, but cost from 2.000 to 4.000 dollars. But how the small firm would know about their importance, and how could it afford them? So the agency buys them, and if anybody wants he may have a look at them at the agency office. This is different from providing money; you are giving them the thing which are necessary to cope with their needs.

Why should these services be provided by the public sector? The point is that most of the real services are based on information, and information

even in economic theory has the nature of a public good, in the sense that it is costly to collect and very difficult to sell at a profit. It is very difficult, infact, to sell a piece of information twice, or three times: news spread around, and very quikly - though it remains useful - became valueless. In some sense, information is similar to a public good, and public goods, even in neoclassical theory, must be provided by the public.

But then, what is the technique of providing real services? I want to describe the technique in four points, and I shall try to be as quick as I can. To whom must the service be given? Which services must be given? How are the services to be delivered, and how are they to be priced and - if we want to make our government officials happy - to be evaluated?.

Let us begin with the first point: to whom is the service to be given? The question here is: are the services to be tailored to a single firm, or to a group of firms? In my opinion there are many reasons why services should not be given to single firms. The first reason is that the entrepreneur would never give you all the details which are

necessary to understand what is going on in his company. At least I have never found anyone who told me everything. He will never say: I cannot make a joint venture with him because I had an affair with his wife. He will never tell you any-thing of this kind, and still, this is a constraint he must obey, and you never catch the real position of the firm. The second reason is any economist who has grown up in Bologna or at M.I.T. and goes to a firm to give advise inevitably finishes up by saying: "Look, I shall tell you what to do". And any entrepreneur to this attitude will answer: "Look, this is my firm, and you please go out of the door". This is the only reasonable answer. I am not saying that he is not prepared to work with you. I am only saying that no one is prepared to accept the patronizing attitude which is invariably a mark of one economist talking to a single small entrepreneur. The last point of not providing services to a single firm is the most important of all. And that is that you may be wrong. You may provide the wrong advice. And if you provide the wrong advice, the whole initiative gets into trouble, dramatic trouble. The voice spreads around, everyone is

told that you are saying rubbish, and the whole initiative fails. On the contrary, if your target is a whole district, with, let us say, 20.000 workers and 2.500 companies, the effect of your action is different. You try to identify the need, and then you offer, you produce one single service, after having studied quite a long time. Sooner or later someone will use it, and you will find that some services will be better used by a young entrepreneur, some services will be used by a female entrepreneur; someone, and this someone is different from case to case, will start experimenting the new way of doing things, and the whole process will start rolling. During this process you shall have time to understand the reasons why people are reluctant to take advantage of the opportunity, and shall have the chance to adjust your product.

Which services must be provided? Here there are two points of reference to be kept in mind.

The first one is that you must somehow increase competition among firms and insure that no firm is squeezing the other firm's project. This means that the higher the number of the firms who work for the final market and who look

backwards to the other firms to buy equipment or components or parts, the better, because the whole system gets a more efficient structure.

The second point is the following. My experience suggests that the strategy of the agency which is going to provide the real service cannot be directly derived from interviews to the firms. Asking directly to the firms would be an efficient procedure only if the firms were big enough, and technologically advanced enough, to precisely identify what their needs are, and the way in which the bottlenecks they face may be coped with. But in the industrial districts the firms are mini, in the sense we said before, and they lack precisely the knowledge of the methods which could be used to overcome their difficulties. In this situation what an economist must do is exactly what a doctor does in a hospital, going in there and saying, tell me about your diseases and I shall tell you about the medicine. It would be somehow funny a doctor going in a hospital and saying, tell me which medicine you need. To arrive at defining the services, you need a huge lot of research. And this is an attitude fairly different from that which usually

characterize the government officials who love simple procedure for distributing money, or giving low interest loans. Usually, the measures which are taken are, let us say, indifferentiated, uniform for all areas and for all people, the only difference - if there is one - being in the degree of help the firms get from the public. Here, on the contrary, research will show that the needs of one district are different from those of another district. And this is the reason why quite a lot of research is necessary to understand which are the specific technical or marketing needs which must find an answuer.

What I have in mind here is something very similar to what Hirschman call linkages: the bottlenecks which may become opportunities for growth. The simple idea is that you must work on specific groups of firms to understand which are their specific needs and provide those services. After all, if the market is not able to provide those services, most probably in those communities the competence to provide that service is lacking, and so is the knowledge to understand precisely which services are needed.

The last point is how to deliver the

services. I have to say that here the watchword is "tailormade"; we must give a tailor-made service. You cannot go there and say, look, you need a CAD-CAM. You go there and say, what are you producing, which kind of CAD-CAM do you need; let us go together to see which CAD-CAM are available, and let me do the work of producing the software which adapts the existing CAD-CAM to your particular needs and to your specific way of working. If the software houses have not produced the CAD-CAM for the furniture/industry, I mean if the market has failed in producing the CAD-CAM the small firms in the district could understand and use, this means that a great deal of work is still to be done, in order to adapt the existing software to a particular way of designing the product and of transforming the blueprint into a production process. Possibly, some of the difficulties arise from the fact that the district needs a CAD-CAM which has to be used in a situation in which there is strong division of tasks among different firms. And Danielle afterwards will tell you which were the specific problems of the people for which she and her agency produced some CAD-CAM with very peculiar

specifications.

And here we are at the very last point, how the price of the services should be fixed. One aim, of course, is to get as many firms using the services as you can. But there must be a price. And I would also say that the price should increase over time. In the sense that, after a while, the agency which is working in a given social and productive texture must recover at least the direct cost which are necessary to produce the service. There is no reason why we should give the services as a gift to the firms. We make the initial investment because the market is not able to offer the service; we start selling it at low prices, because we want the firms to experience it, and to appreciate it, learning new ways of being competitive; but as soon as the new piece of knowledge has spread around, and the firms have became conscious of this need and of the ways to overcome it, we may increase the price, recover the investment, and start doing something else. Or, if our budget allows us to do so, we can simply let the market provide what is needed, and move to some other initiative. But - and this is a point on which the government

officials are often wrong - you cannot measure the utility, the productivity of the service simply by the amount of profit the agency has made year after year. The technique which must be used here is something similar to the cost benefit analysis, based on the number of firms which use the service and on the amount of saving each of them has been able to do.

That is all, thank you.

NETWORK MANUFACTURING AND SMALL BUSINESS COMPETITIVENESS

Testimony of

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before the

United States House of Representatives
Committee on Small Business
Subcommittee on Regulation and Business Opportunities
Ron Wyden, Chairman

13 September 1988

NETWORK MANUFACTURING

Chairman Wyden, Members of the Subcommittee on Regulation and Business Opportunities of the House Committee on Small Business:

I have been asked to comment on the advisability of transferring the European flexible manufacturing network model to the United States, and on the regulatory and other obstacles that must be overcome to accomplish that goal.

As the networking of firms represents a general solution to the problems faced by small businesses, efforts to foster the network concept and overcome the obstacles to its adoption are not merely advisable, they are probably essential.

There are nearly 130,000 small manufacturing establishments in the United States today. They supply some 70 percent of the components used by larger manufacturing firms such as those in the automobile, aerospace, and domestic appliance industries. They produce a variety of consumer goods. They build--especially the smallest of them--the special tools and machines on which US mass production depends. Together they employ about 60 percent of the nation's blue collar workers.

The contribution of these small firms has always been crucial to the performance of the Fortune 500 companies. Their ability to compete is essential not only for their employees and the regions in which they are concentrated, but for the overall competitiveness of US

industry and the strength of the nation's economy.

Like their bigger and better-known brethren, these small manufacturers are under intense pressure from foreign competitors. A great many have traditionally been linked to what are now declining industrial sectors. For them, the growth of imports has led to severe strain. As major corporations downsize and restructure to pare costs, many small firms will find themselves on the outside of the newly rationalized supplier chains.

Small firm wners may well recognize the need to diversify production, to adopt new process technologies or management practices, to explore new markets here and overseas--but they face formidable hurdles in doing so. As firm size goes down the severity of the limitations goes up: access to capital becomes ever more difficult, there is less and less management depth, no time to experiment with advanced technology, little or no money for research and development, and limited marketing savvy.

If individual small firms are weak and vulnerable, a network gives them strength. Networks are, quite simply, cooperative efforts to escape from the limitations of size. The various network systems found in Europe today are regionally- and sectorally-specific responses to the special problems and opportunities created by the internationalization of the market and the potential inherent in computer-based technologies.

That the cooperative network approach is effective is indicated by the economic performance of those regions where networks are most fully developed, for example, the Smaaland area of Sweden, the Land of Baden-Wurttemberg in West Germany, Jutland in Denmark, and especially Emilia-Romagna in north-central Italy. These regions are dissimilar in in their cultures, legal systems, politics, and patterns of industrialization. But they have some enviable, common characteristics: strong manufacturing sectors, very low unemployment, high wages, growing per capita income, active entrepreneurial climates, and substantial export success. They are also regions in which small firms--very small firms in large numbers--are the keys to present industrial prosperity.

I have been observing the evolution of manufacturing networks in Europe for some years, frequently with the support of the German Marshall Fund of the United States as part of its program to help industrial countries find solutions to common problems. From my own observation, let me give you one concrete example of a network in action.

Through network participation, the FSM company in Modena, a small city near Bologna,is able to develop and market advanced robots with a staff of sixteen. This tiny firm concentrates on system specification, marketing, and assembly of completed robots. Components, including sophisticated hydraulic and electronic controls are designed and fabricated by cooperating firms in the vicinity. In all,

more than a dozen companies, some larger and some smaller than FSM, contribute to production. Although it appears in the statistics as a very small firm, in fact FSM coordinates the efforts of several hundred workers. Its customers include the largest machine tool manufacturers in Italy. Its output is shipped around the world. Its success reflects the strength of the network of which it is a part.

Some early investigations suggested that little firms like FSM might be able to survive only in a special, fortuitous niches. Now it seems clear that they have intuited a production system that fits precisely with the forces that are reshaping manufacturing worldwide. Competing lifestyles, high energy costs, conflicting national regulations regarding product safety and environmental impact, and the development of effective demand by new cultural groups continue to redefine market segments, creating a succession of new niches for nimble producers. At the same time, rapid changes in design and technology content have drastically shortened average product life. Market volatility and fragmentation have greatly magnified the difficulties of those companies whose management practices and technological choices inhibit flexibility, innovation, and efficient small batch manufacturing. These are, of course, the very strengths of network firms.

What are the activities in which manufacturing networks typically engage, which differentiate them from ordinary subcontracting chains of value added, and which improve

their chances of success? A survey of manufacturing networks abroad would find firms prospering by doing some or all of the following:

1. Sharing the cost of business services such accounting, advertising, or market forecasting. Economic theory tells us that a major advantage of the giant corporation is its ability to achieve serious economies of scale in adminstration. Networking permits small firms, through cooperation, to enjoy similarly low overhead costs.

2. Forming purchasing consortia to buy commonly-needed materials in bulk at lower prices.

3. Organizing loan guarantee cooperatives to augment their negotiating power with banks and increase access to capital, a familiar problem for small firms everywhere.

4. Entering into cooperative research agreements to perfect new process technologies and/or develop new products.

5. Linking their complementary manufacturing capabiites in novel ways to produce finished goods.

This last case is the manufacturing network in its purest form, but the service-oriented forms of collaboration described above are no less important in making it possible for small firms to perform like big ones while retaining their flexibilty and independence.

Firms that cooperate to improve <u>mutual</u> <u>competitiveness</u> do not do so by attempting to limit production, rig prices, or block the introduction of ideas that could benefit

consumers: They do not because they cannot.

Federal antitrust legislation has traditionally assumed limited numbers of suppliers operating in an essentially domestic market. But, I ask you: what would happen today if a group of small businesses were to attempt to collude in restraint of trade? Their place would be taken--overnight--by other firms. In the absence of high tariff barriers, they would surely be swept aside by competitors from Europe or the Far East. There is no longer any useful distinction to be made between the domestic and international markets--the same players are present in both. And many foreign competitors are organized into state-sponsored cartels.

In recognition of the importance of manufacturing exports, US industries have be offered antitrust exemptions for operations overseas (where they are encouraged to plan complementary production and common marketing strategies). With the disappearance of the domestic market and the rise of international competition, there is every reason for the federal government to assist in the building of networks here. After all, firms that cannot compete at home will hardly be competitive abroad.

Cooperation among limited groups of existing small manufacturing firms is more likely to improve competition than restrain it. Individual Small firms should show improved performance, higher productivity, and lower costs as a result of network participation. Working collaboratively in groups, small firms will be able to

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launch new and better goods and services, increasing consumer choice and well being.

If networks benefit society and improve the small firm's bottom line, why have they not been formed here in large numbers?

Let me try first to set to rest the notion that small firm networks are peculiar to Europe and do not fit American traditions. This is demonstrated by the fact that the network concept has taken strong root in nations as different in culture, politics, and regulatory environment as Sweden, Denmark, German, and Italy. As a way of doing business networks are not a reflection of local history, but a rational response to international markets and modern technologies. US entrepreneurs are imbedded in the identical, global economy. They, too, can learn to cooperate in order to compete.

I believe the basic features of small firm network are very much in the American grain: network manufacturing stresses self-employment, the pleasure of making things, creative challenges, and a sound return on investment. We have thousands of small and medium-sized firms whose competitiveness would be enhanced by close links to complementary enterprises, clients, and suppliers. The development of production networks could well be the shortest route to increased production and exports, more and bettter jobs, and healthier urban and rural communities.

The fundamental obstacle to networking in small business is not cultural, and it is surely not economic. It is fear--fear of of antitrust statutes, fear of litigation, fear of triple damages. We have all seen the lawyers at the table when trade associations meet. In fact, the question I am asked most frequently when I discuss network advantages with small business owners is: what about the Justice Department, what about the FTC?

Several steps have been taken in recent years to encourage collaboration in the interests of US manufacturing competitiveness. Among them are the Export Trading Company Act of 1982 and the National Cooperative Research and Development Act of 1984. In November, 1980, in issuing guidelines for research joint ventures, the Justice Department stated, "the greater the number of actual and potential competitors in an industry, the more likely that a joint research project will not restrain competition." Given the very large number of small manufacturing firms and the importance of helping them protect themselves from foreign competition, especially that from very low wage nations, I believe legislative action to exempt small manufacturers from antitrust regulations is imperative.

Given the large number of small firms and the rapidity with which networks form and reform in order to address changing markets, federal legislation must create an exemption program which is both fair and simple. Drawing on precedents in the two Acts cited above, I would suggest the following:

o Firms wishing to engage in joint service or production activities should be required to file a network plan for review, presumably by the Attorney General. In the absence of negative finding within 60 or perhaps 90 days, the network participants should be free to proceed, with the assurance that an exemption is theirs--so long as their activities and their filed plan coincide.

o Production networks should be not be allowed to aggregate many more than 500 workers. In this way, the manufacturing networks that are formed will themselves be "small businesses." Such networks must, of course, be free to enter into arm's length contracts with outside suppliers.

o Network plans should have a finite life. Five years might be a useful maximum. Should member firms wish to continue their common activities, reporting of results and refiling for review should be required.

In conclusion, the features of the network system might well be seen as goals for the revitalization of manufacturing in the US small firm sector. A list of these features might also be included in the Findings section of the badly-needed Network Manufacturing Exemption Act of 1989. For example:

Cooperative networks formed by small manufacturing firms:

1. Increase flexibility and responsiveness, decreasing sectoral and regional vulnerability to economic cycles and foreign competition.

2. Create quality jobs with satisfaction, mobility, high pay, and incentives for skill development.

3. Encourage the modernization and diversification of existing small firms, enhancing competitiveness and export portential.

4. Promote import substitution by strengthening linkages within industrial areas.

5. Enable small firms to adapt to a market that now demands precision, customization, and combinations of advanced technology and to the growing insistence, on the part of large firms, on engineering design capability and inventory management competence.

Through the joint efforts of government and business, industrial networks can be built. The dynamic regional manufacturing economies that will emerge will have qualities that make them worth fostering: flexibility, creativity, high-wage jobs, and the economic stability that comes with strong local ties. But no matter how great the potential benefits of manufacturing networks, they will not be realized without political will. This Sucommittee of the House of Representatives, in holding these hearings on the need for antitrust exemptions for small firm manufacturing networks has identified a key impediment to renewed industrial competitiveness. I am ready to work with the members of this Subcommittee on the legislation small firms badly need.

Thank you for your attention.

TESTIMONY TO THE U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SMALL BUSINESS, SUB-COMMITTEE ON REGULATIONS
AND BUSINESS OPPORTUNITIES

BY

GOVERNOR RAYMOND P. SHAFER

SEPTEMBER 13, 1988

THANK YOU FOR THE OPPORTUNITY TO TESTIFY ON A SUBJECT WHICH I BELIEVE IS MOST IMPORTANT TO THE FUTURE WELL BEING OF OUR NATION. THE MANUFACTURING SECTOR OF OUR UNITED STATES' ECONOMY FACES A SIGNIFICANT CHALLENGE IN ADOPTING MANAGEMENT STYLES AND TECHNOLOGIES NEEDED TO STAY COMPETITIVE IN THE MARKETPLACE. THIS IS PARTICULARLY CRUCIAL FOR OUR NATION'S SMALL AND MEDIUM SIZED MANUFACTURERS WHICH FORM THE SECOND AND THIRD TIER SUPPLIERS OF MANUFACTURED COMPONENTS TO THE MAJOR CORPORATIONS. THE LOSS OF THIS MANUFACTURING BASE WOULD TOTALLY UNDERMINE OUR ECONOMY.

LET ME EXPLAIN WHY OUR MANUFACTURING BASE IS SO CRITICAL TO OUR ECONOMY. MODERN SOCIETY IS UNDERGOING A TRANSITION IN THE TYPE OF JOBS WHICH PROVIDE EMPLOYMENT FOR THE MAJORITY OF PEOPLE - FROM MANUFACTURING JOBS TO SERVICE ORIENTED JOBS. OUR NATION WENT THROUGH A SIMILAR TRANSITION A HUNDRED YEARS AGO, WHEN THE PRINCIPAL EMPLOYMENT BASE SHIFTED FROM AGRICULTURE TO MANUFACTURING.

FOR ANY SOCIETY TO BE SUCCESSFUL, IT MUST FIRST BE ABLE TO FEED ITSELF. THE GREATEST AGRICULTURAL ECONOMY IN THE WORLD BELONGS TO THE UNITED STATES. OUR AGRICULTURAL SELF-SUFFICIENCY GAVE OUR NATION THE BASE WHICH ALLOWED US TO BECOME THE GREATEST

MANUFACTURING NATION IN HISTORY, EVEN THOUGH THE PERCENTAGE OF OUR NATION'S WORKFORCE EMPLOYED IN FARMING DROPPED SIGNIFICANTLY OVER THE LAST CENTURY. IT IS A TRUISM THAT WE WOULD NOT HAVE BEEN ABLE TO PUT PEOPLE TO WORK IN MANUFACTURING IF WE HAD NOT BEEN ABLE TO FEED THEM.

TODAY, THE MANUFACTURING SECTOR OF OUR ECONOMY IS UNDERGOING A SIMILAR TYPE OF TRANSITION WHICH OUR AGRICULTURAL SECTOR WENT THROUGH LAST CENTURY. MORE AND MORE EMPLOYMENT IS BEING PROVIDED IN OUR SOCIETY THROUGH SERVICE JOBS SUCH AS THOSE IN THE RETAIL, INSURANCE, CONSULTING, HEALTH AND BANKING INDUSTRIES.

ALTHOUGH SERVICE SECTOR JOBS ARE CRITICAL TO THE ECONOMIC WELL BEING OF THE UNITED STATES, THEY DO NOT PRODUCE GOODS. WITHOUT A STRONG MANUFACTURING BASE PRODUCING PRODUCTS, A STRONG SERVICE SECTOR ECONOMY CANNOT EXIST. IF THERE IS NO PRODUCTION, THERE IS NOTHING TO SERVICE. OUR ECONOMY IS AS DEPENDENT ON A STRONG MANUFACTURING BASE AS IT IS ON OUR STRONG AGRICULTURAL BASE. PRESENTLY EACH MANUFACTURING JOB GENERATES SEVEN SERVICE SECTOR JOBS. IT IS FORECAST THAT THIS NUMBER WILL GROW TO AS MANY AS TWENTY SERVICE SECTOR JOBS FOR EACH MANUFACTURING JOB, AS ADVANCES IN TECHNOLOGY INCREASES THE PRODUCTIVITY OF THE MANUFACTURER.

THE STRENGTH OF THE AGRICULTURAL BASE IN THE UNITED STATES IS SECURE DUE TO THE GREAT NATURAL RESOURCE OUR NATION HAS IN THE GREAT PLAINS. OUR MANUFACTURING BASE, HOWEVER, IS BEING SEVERELY CHALLENGED, PARTICULARLY THE SMALL AND MEDIUM SIZED MANUFACTURERS, WHO FORM THE SUPPORT BASE FOR THE LARGE, HEAVY

INDUSTRIES OF OUR COUNTRY.

THE TECHNOLOGY PRESENTLY EXISTS TO PLACE A MANUFACTURING FACILITY ANYWHERE IN THE WORLD WHICH CAN OPERATE UNATTENDED--TWENTY FOUR HOURS A DAY, SEVEN DAYS A WEEK--PRODUCING HIGH QUALITY PRODUCTS ON AN AS-NEEDED BASIS AT PRICES LOWER THAN THOSE ON TODAY'S MARKET. THE MANUFACTURING TECHNOLOGY PRESENTLY AVAILABLE CAN:

- INCREASE LABOR PRODUCTIVITY FROM 50% TO 400%,
- INCREASE CAPITAL EQUIPMENT PRODUCTIVITY FROM 50% TO 300%,
- INCREASE FLOOR SPACE PRODUCTIVITY UP TO 100%

FACTORIES USING THESE TECHNOLOGIES PRESENTLY EXIST IN JAPAN, KOREA, TAIWAN, ITALY AND GERMANY, TO NAME JUST A FEW COUNTRIES-AND MORE NATIONS, SUCH AS CHINA, ARE INSTALLING THEM BECAUSE THEY PROVIDE THOSE COUNTRIES ACCESS TO THE GREATEST MARKET IN THE WORLD - THE U.S. MARKET - AND THE CASH THAT CAN BE GENERATED FROM THAT MARKET.

IT IS IMPERATIVE THAT SMALL AND MEDIUM SIZED MANUFACTURING FIRMS OF THE UNITED STATES BE ABLE TO EFFECTIVELY MODERNIZE, AND ADOPT THE TECHNOLOGIES NEEDED TO COMPETE IN TODAY'S WORLD. IF OUR SECOND AND THIRD TIER MANUFACTURERS ARE UNABLE TO MODERNIZE, WE WILL VERY LIKELY FACE A SITUATION OF ECONOMIC COLLAPSE OR SERIOUS RECESSION IN THE UNITED STATES. THERE ARE THREE MAJOR PROBLEMS FACED BY SMALL AND MEDIUM SIZE FIRMS IN MODERNIZING: (1) THE HIGH CAPITAL COST FOR EQUIPMENT, VENTURE CAPITAL AND SOFTWARE; (2) THE SHORTAGE OF ADEQUATELY TRAINED WORKERS AND (3) A NEEDED CHANGE IN MANAGEMENT PHILOSOPHY. I WILL SPECIFICALLY

ADDRESS EACH ONE OF THESE PROBLEM AREAS.

ACCESS TO CAPITAL. SMALL AND MEDIUM SIZE MANUFACTURERS ARE CONFRONTED WITH THE HIGH COST OF THE EQUIPMENT NEEDED TO MODERNIZE. LARGE FIRMS HAVE THE CAPITAL AVAILABLE TO MODERNIZE; SMALLER FIRMS DO NOT HAVE THAT LUXURY. IN THE UNITED STATES, THERE ARE IN GENERAL THREE OPTIONS WHICH A COMPANY HAS TO RAISE CAPITAL. ONE IS VENTURE CAPITAL. THE MAJOR PROBLEM WITH VENTURE CAPITAL IS THAT TO OBTAIN IT, ONE MUST GIVE UP CONTROL OF THE COMPANY, AN OPTION THAT IS OBVIOUSLY NOT POPULAR WITH SMALL BUSINESSES. THE SECOND OPTION IS TO SELL STOCK AND GO PUBLIC. THIS TOO HAS THE DISADVANTAGE OF REQUIRING THE SMALL BUSINESSMAN, WHO CREATED AND DEVELOPED HIS BUSINESS, TO DILUTE HIS CONTROL OF THAT BUSINESS. THUS, THIS TOO IS AN UNFAVORABLE OPTION. THE THIRD AND MOST OFTEN USED CAPITAL RESOURCE IS ASSET FINANCING, WHICH HAS BECOME MORE DIFFICULT IN RECENT YEARS DUE TO THE LOSS OF THE INVESTMENT TAX CREDIT. NEVERTHELESS, IT IS STILL THE MOST FAVORABLE OPTION FOR A SMALL COMPANY TO USE TO MODERNIZE.

THUS IT SEEMS TO ME THAT THE ROLE GOVERNMENT MUST ADDRESS AT THIS CRITICAL TIME IS TO PROVIDE INCENTIVES TO SMALL AND MEDIUM SIZED MANUFACTURERS TO MODERNIZE. A STUDY RECENTLY COMPLETED BY UNDER SECRETARY OF DEFENSE COSTELLO ENTITLED "BOLSTERING DEFENSE INDUSTRIAL COMPETITIVENESS," POINTS OUT THAT OUR NATION'S TAX POLICIES DISCOURAGE INDUSTRIAL MODERNIZATION AND ENCOURAGE FOREIGN SOURCING OF PARTS. DELETING THE INVESTMENT TAX CREDIT FOR SERVICE INDUSTRIES MAY OR MAY NOT BE JUSTIFIED, BUT DELETING IT FOR MANUFACTURING INDUSTRIES MAY BE ECONOMIC SUICIDE. IF WE

FAIL TO TAKE ADVANTAGE OF THE PRESENT LOW VALUE OF THE DOLLAR AND DO NOT MODERNIZE OUR NATION'S MANUFACTURING BASE, WE ARE IN A REAL DANGER OF LOSING THAT BASE AS WELL AS THE SERVICE SECTOR ECONOMY WHICH IS SUPPORTED BY IT! OUR GOVERNMENT NEEDS TO PROVIDE DIRECTION, AND THIS IS BEST DONE THROUGH INCENTIVES! THUS I URGE GOVERNMENT TO REESTABLISH INVESTMENT TAX CREDITS FOR MODERNIZING MANUFACTURING IN THIS COUNTRY!

IT NEEDS TO BE RECOGNIZED THAT IF A COMPANY MAKES THE WRONG SELECTION OF EQUIPMENT - EQUIPMENT WHICH IS SO EXPENSIVE THAT THE COMPANY IS PUT AT RISK TO BE ABLE TO PURCHASE THAT EQUIPMENT- THE COMPANY FACES THE POSSIBILITY OF BANKRUPTCY AND THE ACCOMPANYING TRAGEDY -- THE LOSS OF JOBS.

THE NEED FOR A COMPANY, TO BE ABLE TO EFFECTIVELY USE NEW EQUIPMENT, LEADS TO THE PROBLEM SMALL AND MEDIUM SIZE FIRMS FACE IN THE LACK OF AN ADEQUATELY TRAINED WORK FORCE. BY THIS, I MEAN THAT THERE ARE JUST NOT ENOUGH OPERATORS AND MANAGERS WHO HAVE THE UNDERSTANDING OF COMPUTER SYSTEMS, INTEGRATED ENGINEERING SYSTEMS AND THE MANUFACTURING PROCESSES USED IN ADVANCED MANUFACTURING.

THE PROSPECT OF SUPPLYING THE NEEDED WORKFORCE IS NOT ENCOURAGING. ONE FOURTH OF THIS YEAR'S NINTH GRADE STUDENTS IN THIS COUNTRY WILL NOT GRADUATE FROM HIGH SCHOOL. ONE MILLION YOUTHS ARE DROPPING OUT OF SCHOOL EACH YEAR. PRESENTLY, ONE OF EVERY EIGHT SEVENTEEN-YEAR-OLDS IS FUNCTIONALLY ILLITERATE. THE TRAINING REQUIRED FOR THE FIVE TO FIFTEEN MILLION MANUFACTURING JOBS ESTIMATED TO BE REQUIRED IN THE YEAR 2000, IS NOT AVAILABLE

IS TODAY'S HIGH SCHOOLS. THE TRAINING IS EVEN DIFFICULT TO OBTAIN THROUGH OUR COLLEGES AND UNIVERSITIES. THUS WE SEE THAT OUR PRESENT EDUCATIONAL SYSTEM IS NOT MEETING THIS NEED OF SOCIETY, AND IT FOLLOWS THAT WE MUST ENCOURAGE CHANGES WHICH WILL PROVIDE THE SKILLS FOR TOMORROW'S SOCIETY.

THIS PROBLEM IS NOT LIMITED TO THE WORKFORCE. MANAGERS DO NOT HAVE AN UNDERSTANDING OF QUALITY OR MANUFACTURING PROCESSES. THIS IS IN A LARGE PART DUE TO THE THIRD, AND, IN MY OPINION, THE MOST SIGNIFICANT PROBLEM CONFRONTING MANUFACTURERS, A PHILOSOPHY PROBLEM THAT RESULTED FROM OUR DOMINANCE IN THE WORLD MARKET AFTER WORLD WAR II.

PRIOR TO WORLD WAR II WHEN THE UNITED STATES WAS IN WORLD COMPETITION, WE HAD TO PRODUCE QUALITY GOODS TO BE ABLE TO BE COMPETITIVE. IN ORDER TO DO SO EFFECTIVELY, STATISTICAL PROCESS CONTROL QUALITY STANDARDS WERE DEVELOPED TO CONTROL AND ENSURE QUALITY. IT WAS THESE STANDARDS AND MANUFACTURING PHILOSOPHY THAT PLAYED A SIGNIFICANT ROLE IN OUR WINNING OF WORLD WAR II. AFTER THAT WAR, WHEN WE WERE THE ONLY MANUFACTURING SOCIETY LEFT IN THE WORLD, WE COULD DICTATE WHAT THE MARKETS WERE TO BUY, AND CONSEQUENTLY WE FOUND NO NEED TO CONTINUE STATISTICAL PROCESS QUALITY CONTROL IN THE MANUFACTURING PROCESS. AS A RESULT, IT WAS DROPPED FROM THE BUSINESS CURRICULUMS TAUGHT IN OUR EDUCATIONAL INSTITUTIONS.

CONVERSELY, WHEN PRESIDENT TRUMAN DIRECTED GENERAL MCARTHUR TO REBUILD JAPAN, MCARTHUR BROUGHT DR. EDWARD DEMING TO JAPAN. DR. DEMING EMBODIED THE PHILOSOPHY OF STATISTICAL PROCESS CONTROL

AND ESTABLISHING QUALITY. THE JAPANESE MANUFACTURING BASE WAS REBUILT USING THIS MODEL. AS A RESULT, THE JAPANESE BUSINESS PHILOSOPHY HAS BEEN EMPHASIZING MARKET SHARE VERSUS QUARTERLY PROFITS, AND THE PROCESS BY WHICH THEY COULD OBTAIN GREATER MARKET SHARE. INITIALLY THEY STARTED OUT WITH CHEAP GOODS THAT COULD BE PRODUCED INEXPENSIVELY AND TAKE ADVANTAGE OF THE RESOURCES THEY HAD AVAILABLE TO GAIN ENTRY INTO A MARKET. THEY THEN INCREASED THE QUALITY OF THEIR PRODUCTS TO EXPAND THEIR PORTION OF THAT MARKET.

THE JAPANESE IMPROVED QUALITY, WHILE REDUCING COSTS IN SPECIFIC MARKETS THEY CHOSE TO PENETRATE. IN CONTRAST THE UNITED STATES' BUSINESS PHILOSOPHY PRIMARILY CENTERED ON WHAT HAD TO BE DONE TO DEMONSTRATE TO THE STOCK HOLDERS AND THE OWNERS A PROFIT ON A QUARTERLY BASIS PLUS CONTINUED GROWTH.

TO ADDRESS THE PROBLEMS OF HIGH CAPITAL COSTS, LACK OF TRAINED WORK FORCE AND THE NEEDED CHANGE IN MANAGEMENT PHILOSOPHY, THE UNITED STATES DEPARTMENT OF COMMERCE, OFFICE OF PRODUCTIVITY, TECHNOLOGY AND INNOVATION UNDER DR. BRUCE MERRIFIELD HAS DEVELOPED THE CONCEPT OF A SHARED FLEXIBLE MANUFACTURING FACILITY. THIS FACILITY WOULD BE THE FOCUS OF A NETWORK OF MANUFACTURING FIRMS WHICH WOULD USE THE SERVICES OF THE FACILITY.

A NUMBER OF PRIVATE INDUSTRIES LOCATED IN MEADVILLE, PENNSYLVANIA, IN CONJUNCTION WITH THE MEADVILLE AREA CHAMBER OF COMMERCE HAVE ADOPTED THIS CONCEPT AND FORMED THE NATIONAL INSTITUTE OF FLEXIBLE MANUFACTURING (NIFM). THE NIFM IS A NON-

PROFIT CORPORATION, FORMED TO OWN, OPERATE AND MAINTAIN A FACILITY FOR THE DEVELOPMENT, TEACHING, TRAINING AND TRANSFER OF STATE-OF-THE-ART MANUFACTURING TECHNOLOGIES TO MANUFACTURING ENTERPRISES.

MEADVILLE HAS A VERY HIGH CONCENTRATION OF TOOL AND DIE COMPANIES. MANY OF THESE COMPANIES WHERE CREATED TO SUPPORT TALON INC., AT ONE TIME THE WORLD'S PRINCIPAL MAKER OF ZIPPERS. TALON AND OTHER MAJOR MANUFACTURERS IN THE REGION HAVE LOST THEIR MARKET SHARE TO OVERSEAS COMPETITORS. THE RESULTING LOSS OF CONSUMERS HAS HURT THE TOOL AND DIE INDUSTRY IN MEADVILLE.

THE PRESIDENT OF ONE OF THESE COMPANIES, MR. HAROLD CORNER, RECOGNIZED THE NEED TO DIVERSIFY HIS PRODUCT BASE, TRAVELED TO SEE WHAT HIS FOREIGN COMPETITION WAS DOING, REALIZED THAT HIS FIRM ALSO HAD TO MODERNIZE TO REMAIN COMPETITIVE, AND DID SO.

MR. CORNER IS A PAST PRESIDENT OF THE NATIONAL TOOLING AND MACHINING ASSOCIATION. WITH HIS EXPERIENCE, EXPERTISE, AND UNDERSTANDING OF THE PROBLEM, MR. CORNER HAS BEEN THE DRIVING FORCE BEHIND THE CREATION OF THE NIFM.

THE NIFM WILL BE THE NATIONAL DEMONSTRATION OF A SHARED FACILITY IN WHICH COMPANIES TIME-SHARE THE FACILITIES' PRODUCTION CAPABILITY WHILE TRAINING MANAGERS AND OPERATORS IN THE USE OF MANUFACTURING TECHNOLOGY.

THE FACILITY WILL INITIALLY CONSIST OF A METAL-WORKING MACHINING CELL USED AS A PRODUCTION TEACHING FACTORY. FUTURE EXPANSION INTO THE MANUFACTURING OF ELECTRONIC SUB-ASSEMBLIES, PLASTIC INJECTION MOLDING, AND PROCESSING OF CERAMICS AND

COMPOSITE MATERIALS IS PLANNED. THE FACTORY WILL CONSIST OF A FLEXIBLE MANUFACTURING SYSTEM (FMS) THAT WILL PRODUCE A VARIETY OF PRODUCTS WITH MINIMAL DIRECT LABOR.

TO DEMONSTRATE THAT THIS FACTORY CAN BE RUN PROFITABLY, LOCAL MANUFACTURERS WILL BE LEASING TIME ON THE FACTORY'S EQUIPMENT TO PRODUCE PRODUCTS THAT THEY WILL THEN SELL, AS THEY WOULD ANY OF THE PRODUCTS PRODUCED IN THEIR OWN FACTORIES. THE PROFITS THAT ARE GENERATED IN THE FACTORY PORTION OF THE NATIONAL INSTITUTE FOR FLEXIBLE MANUFACTURING WILL BE USED AS SUBSIDIES TO ASSIST IN PAYING FOR THE TRAINING COURSES THAT ARE OFFERED AT THE INSTITUTE.

THE DEMONSTRATION OF EQUIPMENT MAKING A PROFIT WHILE PRODUCING A COMPANY'S PRODUCTS, PROVIDES A COMPANY WITH THE FAMILIARIZATION NEEDED TO BE ABLE TO SMARTLY JUSTIFY THE CAPITAL INVESTMENTS NEEDED TO MODERNIZE.

THE NIFM WILL CONTAIN CLASSROOM SPACE DEVOTED TO TRAINING PERSONNEL, FROM A COMPANY'S CHIEF EXECUTIVE OFFICER TO SHOP EMPLOYEES, IN THE MANAGEMENT AND OPERATION OF THE TECHNOLOGIES PRESENTED IN THE FACILITY.

EXTENSIVE TRAINING ON THE OPERATIONS AND MAINTENANCE OF THE FLEXIBLE MANUFACTURING SYSTEM WILL ALSO BE AVAILABLE AT THE NIFM. THIS TRAINING WILL INCLUDE THE ELECTRO-MECHANICAL OPERATIONS OF THE EQUIPMENT AS WELL AS THE COMPUTER HARDWARE, SOFTWARE, AND NETWORKING WHICH IS NEEDED. THE CURRICULUM WILL INCLUDE AN INTENSIVE CLASSROOM PHASE ADDRESSING THE THEORY OF THE MANUFACTURING TECHNOLOGY USED AT THE NIFM. THE CLASSROOM PHASE

WILL BE FOLLOWED BY OPERATIONAL TRAINING ON PRODUCTION EQUIPMENT. THIS PROGRAM IS MODELED ON THE NUCLEAR PROPULSION TRAINING PROGRAM DEVELOPED BY ADMIRAL RICKOVER TO TRAIN THE CREWS OF NUCLEAR SUBMARINES.

THE PHILOSOPHY OF PRODUCING QUALITY PRODUCTS BY CONTINUING TO BETTER THE MANUFACTURING PROCESS WILL PERMEATE THE MANAGEMENT AND TECHNICAL INSTRUCTION AT THE NIFM.

AS THE NATIONAL INSTITUTE FOR FLEXIBLE MANUFACTURING IS ORGANIZED AS A NON-PROFIT CORPORATION, THERE ARE NO OWNERS, IT WILL NOT BE COMPETING WITH THE PRIVATE SECTOR, AND THE NIFM WILL BE USED STRICTLY AS A RESOURCE BY PRIVATE SECTOR COMPANIES IN THE REGION. THE SIZE AND SCOPE OF THE INSTITUTE WILL BE DICTATED BY THE AMOUNT OF PRIVATE SECTOR INVOLVEMENT AND INVESTMENT IN THE INSTITUTE.

THE NIFM HAS BEEN A MODEL IN DEMONSTRATING HOW FEDERAL AND STATE GOVERNMENT CAN WORK WITH THE PRIVATE SECTOR. THE NIFM HAS RECEIVED A SIGNIFICANT AMOUNT OF SUPPORT THROUGH TIME SPENT IN ADVISORY ASSISTANCE AND RAISING AWARENESS FROM BOTH THE PENNSYLVANIA STATE DEPARTMENT OF COMMERCE AND THE U.S. DEPARTMENT OF COMMERCE OFFICE OF PRODUCTIVITY, TECHNOLOGY AND INNOVATION.

PENNSYLVANIA AND THE ECONOMIC DEVELOPMENT ADMINISTRATION HAVE PROVIDED THE SEED MONIES TO ESTABLISH THE NIFM AND COORDINATE PRIVATE SECTOR INVOLVEMENT. THE NIFM INTENDS TO BE FULLY INDEPENDENT OF STATE AND FEDERAL FUNDING AFTER 3 YEARS.

IN PROVIDING THE MANUFACTURING INDUSTRY WITH A SOURCE OF MANAGERS AND OPERATORS TRAINED ON ADVANCED MANUFACTURING

EQUIPMENT OPERATING IN A PRODUCTION MODE, AND DEMONSTRATING THE INCREASES IN PRODUCTIVITY AVAILABLE, BEFORE RISKING LARGE SUMS OF CAPITAL, THE NATIONAL INSTITUTE OF FLEXIBLE MANUFACTURING IS ONE ANSWER TO THE CRUCIAL PROBLEMS FACED BY SMALL AND MEDIUM SIZE MANUFACTURERS IN THE UNITED STATES IN MODERNIZING.

I WANT TO SAY AGAIN AND TO STRONGLY EMPHASIZE THIS FACT: THE ECONOMIC WELL BEING OF OUR NATION IS DEPENDENT ON THE SUCCESS OF OUR NATION'S MANUFACTURING MODERNIZATION, AS IS THE POLITICAL STABILITY WHICH HAS MADE AMERICAN DEMOCRACY THE GREATEST GOVERNMENT IN HISTORY. ALL OF THE NATION'S RESOURCES NEED TO BE MOBILIZED AND COORDINATED IN THIS EFFORT. STARTING NOW, WE MUST SOLVE THE PROBLEMS OF PROPER GOVERNMENT INCENTIVES AND EFFECTIVE SKILLS EDUCATION IN THIS COUNTRY, WHILE WE STILL HAVE TIME TO DO SO.

THANK YOU!

THE ROLE OF COOPERATIVE ARRANGEMENTS AMONG FIRMS IN OREGON'S ECONOMY: THE CASE OF FLEXIBLE MANUFACTURING NETWORKS

An annotated outline of remarks by

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before the

Subcommittee on Regulation and Business Opportunities
Committee on Small Business
U.S. House of Representatives

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I. WHAT ARE THE RELEVANT FACTS, ASSUMPTIONS, AND PROBLEM?

A. FACTS

1) Every firm can be viewed as a packet of functions (e.g., management, storage, production, marketing, ...) and, within limits, these functions can be performed outside the firm.

2) A firm's different functions are characterized by different scale economies, and the point at which these scale economies can be exhausted varies among the functions.

3) A small firm acting alone cannot exploit the scale economies of all the firm's functions.

4) A flexible manufacturing network is a cooperative arrangement among manufacturing firms to enable them collectively to exploit the economies of scale that individually they could not.

5) In many foreign economies and in the U.S. and Oregon economies, the number of small manufacturing firms, the share of all manufacturing firms that are small, and the share of manufacturing output contributed by small firms have all increased in the recent past.

6) The share of manufacturing output destined for foreign trade from European and Pacific Rim countries exceeds that from the U.S., and the share from the U.S. has been increasing during the past several decades.

7) Clusters of small firms in many foreign economies are exploiting their scale economies through cooperative arrangements such as flexible manufacturing networks.

8) The share of manufacturing output destined for foreign trade from California and Washington exceeds that from Oregon, and the share from all three states has been increasing during the past twenty years.

9) In Oregon, the share of manufacturing output destined for trade with other states, especially California, exceeds that destined for trade with foreign countries.

10) In the U.S., antitrust legislation is more pervasive and restrictive than in the economies of any of our trading partners.

B. ASSUMPTIONS:

1) In the U.S. and Oregon economies, the economies of scale enjoyed by small manufacturing firms through collective arrangements have not yet been exhausted.

2) In the U.S. and Oregon economies, the increased number, share, and role of small manufacturing firms likely will persist in the foreseeable future.

3) The share of manufacturing output destined for foreign trade from European and Pacific Rim countries will continue to exceed that from the U.S., and the share from the U.S. will continue to increase during the next several decades.

4) The opportunities for Oregon to sell its manufacturing output in domestic and foreign markets will continue to increase.

C. PROBLEM

Without appropriately designed and implemented governmental action, the time it would take for small manufacturing firms in the U.S. and in Oregon to become aware of and then to exploit the benefits that cooperative arrangements such as flexible networks offer would be much longer than with it.

II. WHAT ARE SOME ILLUSTRATIVE MANUFACTURING INDUSTRIES–CLUSTERS OF FIRMS–IN OREGON FOR WHICH COOPERATIVE ARRANGEMENTS, E.G., FLEXIBLE NETWORKS, WOULD MAKE SENSE?

A. What are some of the Oregon industries you would expect?

computer software, computer hardware, custom electronics, secondary wood products, agricultural products and food processing, apparel, metals, environmental technology,

B. What are some you might not expect?

micro breweries, wineries, essential oils (e.g., mint, caraway), crafts, specialty foods

C. Is there a limit to the industries in Oregon that could exploit cooperative arrangements?

There are several ways to address this question, but none of them suggests a limit to the number of industries or to the number of clusters within the industries that could exploit cooperative arrangements. One way to address the question is to evaluate the output of the industry: the less commodity-like (e.g.,) and the more product-like (e.g., oscilloscopes), the better that industry can exploit cooperative arrangements.

Another is to assess the industrial organization of the industry, i.e., the relationships among the firms in the industry: most of the major texts on industrial organization, e.g., F.M. Scherer, Industrial Market Structure and Economic Performance, 2nd edition (Chicago: Rand McNally College Publishing Company, 1980, and Doublas F. Greer, Business, Government, and Society, 2nd edition (New York: Macmillan Publishing Company, 1987); the current work by Robert E. Smith (University of Oregon) on horizontal, vertical, and conglomerate interfirm relationships and structure.

Yet another is to investigate the experience of cooperative arrangements elsewhere, i.e., elsewhere in the U.S. or abroad: Robert M. Lichtenberg's classic analysis of the clustering of manufacturing industries in the New York Metropolitan Region, One-Tenth of a Nation (Cambridge, Mass.: Harvard University Press, 1960); descriptions of Italy's and Denmark's experience by Richard Hatch, Anne Birgitte Lundholt, and Mogens Kring in The Entrepreneurial Economy, 6(1), July/August 1987

To repeat, though, none of the approaches suggests a limit to the number of industries that could exploit the scale economies cooperative arrangements offer.

III. WHAT GOVERNMENTAL ACTION WOULD FACILITATE OREGON'S SMALL MANUFACTURING FIRMS FORMING COOPERATIVE ARRANGEMENTS, E.G., FLEXIBLE NETWORKS, TO OPERATE MORE EFFICIENTLY AND COMPETE MORE EFFECTIVELY?

Cooperative arrangements among Oregon's manufacturing firms will be an integral part of Governor Goldschmidt's long-term economic strategy for Oregon.

A. Projects and Direct Action:

1) Soliciting federal demonstration projects:

- National Bureau of Standards mini-centers for flexible manufacturing technology
- U.S. Forest Service demonstration project on secondary softwood products similar to the one for secondary hardwood products in West Virginia

2) Supporting state projects:

- Oregon Institute for Advanced Computing
- Oregon's (proposed) Business Extension Service through Oregon's Community Colleges
- Oregon Science Council's (proposed) public-private sponsored research centers for metals, environmental technology, wood products, agriculture, and advanced computing

3) Disseminating information on clusters of firms:

- Oregon Market Place (for matching local suppliers for Oregon's firms that import supplies)
- Oregon's Software Council (an association of small software firms for finding resources they can use collectively)

B. Process and Indirect Action:

1) Continuing the discussions:

- Oregon/Washington/Minnesota Seminars on Flexible Networks

2) Clarifying the pro- and anticompetitive effects of cooperative arrangements among firms; investigating possible exemptions from antitrust legislation; and educating the cooperatives and networks on ways of avoiding antitrust violations

3) Educating employers and employees of increasing international competition

4) Educating Oregon's K-12 and undergraduate students on the increasing globalization of our economies; supporting changes in the K-12 and undergraduate curricula, e.g., geography, world economies, world languages

TESTIMONY OF BRIAN BOSWORTH
INDIANA ECONOMIC DEVELOPMENT COUNCIL, INC.
TO THE
UNITED STATES HOUSE OF REPRESENTATIVES
COMMITTEE ON SMALL BUSINESS
SUBCOMMITTEE ON REGULATION AND BUSINESS OPPORTUNITIES

SEPTEMBER 13, 1988

Thank you for the opportunity to discuss flexible manufacturing networks and their implications for economic development policy in the United States. I will leave to others the description of how this pattern of collaborative behavior among small companies works in Western European settings. I would like to use my time to offer some context within which we can understand the application of flexible networks to the U.S. economy.

My thesis is that trends of change in the world economy will bring enormous changes to business establishments in the U.S. These changes require a re-focusing of our development strategies. The collaborative concepts of flexible manufacturing provide a framework for that re-focusing.

We have heard so frequently of the massive transformation or restructuring of the global economy that the notion has become somewhat of a cliche. But that does not make it any less true or less consequential. The pace, intensity and direction of the current economic transition are fundamental, with enormous implications for development strategy. The key engines powering this change are the scope and frequency of technological improvement and the comparatively sudden impact on the United States worldwide market competition. During this historic transition, the relative positions of economic wealth, power and opportunity among nations, states and groups of people are being radically reshuffled.

It may be helpful to understand this transition as the convergence of seven inter-related trends. They concern markets, products, processes, business structures, the work force, the workplace, and social structures.

Markets

Two major trends of changes are underway in the marketplace for goods and services. They are segmentation and internationalization. Markets for both producer and consumer goods have shattered into fragments. Highly articulated demand, generated by divergent tastes and propelled by changes in the technology of communication, transportation and information processing, has produced an increasingly niche-oriented market.

A specific, if perhaps exaggerated, example of this trend may be seen in the food products industry where processors who once invented mass marketing are now tailoring products, advertising and sales efforts to narrow regions, ethnic groups and demographic categories. Another example may be found in the U.S. market for automobiles. In 1988, over 600 name brands of autos were sold in the U.S.; quite a change from the years dominated by Henry Ford's Model "T" and later his Model "A".

This segmentation of the market produces a wide array of opportunity for those who can differentiate their product to suit the specialized demand of narrow market segments. Moreover, it makes the playing field more level. The small and agile company can survive and prosper in competition against the big.

Accompanying the trend toward market niches has been the globalization of the market. Goods and services produced in the U.S. now compete with goods and services from around the world -- whether they are sold in foreign countries or whether they are sold right here in the U.S. Businesses can elect not to export their products, but they cannot opt out of worldwide market competition. Products produced from all over the world will compete with the products of Indiana companies in our traditional domestic marketplace. Those businesses that cannot compete in an international market will not be able to survive in a domestic market.

A second facet of internationalization is the growth of manufacturing systems across national boundaries. Component goods can be designed, engineered, assembled, and marketed in a number of countries. Companies have tended to move closer to their markets in whatever ways they can. As a result, manufacturing technologies have taken root all over the world. They are no longer limited to a few traditionally industrialized countries.

Products

For several decades, the U.S. was advantaged, relative to the rest of the world, in the production of standardized goods and services. As craft oriented manufacturing of the early 20th century gave way to the assembly lines that came to characterize the post-World War II era, our relative abundance of raw materials and basic industrial inputs (water, steel, natural gas and coal) gave us a strong position in standardized, serial production.

Such products were best produced through economies of scale. Homogeneous product for homogeneous markets could be produced in huge batches through routine process. In the farm sector, similar economies were produced through more and more mechanization of larger and larger farms.

But, steady increases in production costs began to erode some of this country's economy of scale advantage in the 1960's and early 1970's. By the mid 1970's, the trend of relocation of standardized production out of the U.S. accelerated.

Standardized commodity production now has the mobility to seek out cheaper cost production areas in other parts of the world.

Our comparative advantage is shifting rapidly toward customized production -- toward products that incorporate higher levels of skill, knowledge and technology in their final embodiment. Such products do not lend themselves to mass assembly driven by economy of scale considerations. They tend to be either very new products not otherwise available or mature products which are greatly specialized to particular applications or demand.

Customized products usually have short life cycles. Customized products tend to compete on the basis of quality, precision and reliability of delivery as well as performance. While cost continues to be a very important

determinant of competitiveness, short product life cycles and specialization of application tend to discourage economy of scale production technique as the principal factor in cost control. Rather, cost control must be found in design, in "manufacturability" and in the quality of management.

The need for quality in customized product cannot be over-emphasized. A standard product is not always expected to fit the requirements of every application. But a good or service purchased as a custom product must satisfy precisely the high expectations of the purchaser. These quality requirements can be satisfied only by a combination of advanced technology, highly skilled workers and rigorous management of production systems.

Processes

Underlying and intertwined with these changes in markets and products are changes in processes. The trend of change here is from the routine to the flexible.

Hard automation techniques of the past emphasized capturing "know-how" and building it into special purpose machines or systems. Flexibility was traded off for efficiency. But the emerging technology of new production process is based upon customizing products for segmented markets. It requires the ability to produce multiple products off the same machine or system of machines and with the same workers. This new technology permits a broader range of capabilities in a single machine, production system or business establishment.

Variety and flexibility no longer reduce profit. Rather, they are essential to business success in a rapidly changing, niche-oriented marketplace demanding specialized, tailor-made products.

The effect of these emerging changes in the technology of production process is no longer merely the substitution of capital for labor. The new technology focuses on reducing time, improving quality and slashing inventory levels. Flexible machines, flexible systems and flexible people are the essential ingredients of this technology. For a worker entering the job force today, the chief criterion of success is not having a narrow job skill. Instead, it is the ability to learn new tasks, and to learn them quickly and accurately, again and again and again.

Business Establishments

These trends in markets, products and processes are driving enormous changes in the structure of business establishments. Establishments are shrinking in size, shedding overhead and stripping away layers of management hierarchy. Business establishments must react quickly to rapid demand shifts in the marketplace, to greater emphasis on innovation and to the trend toward more specialized, higher quality and short-lived products. The need for speed and accuracy of that response will drive a general decentralization of organization. Smaller organizational units may have a decided advantage over big ones. Large-scale, vertically integrated establishments may lack the agility of smaller, more specialized, more "nimble" establishments.

In addition to changes in the scale of autonomous business units, there are important changes underway in the relationship among functions within these establishments. Customization of products demands a much more intimate relationship among design, manufacturing and marketing. Moreover, the trend

toward a more broadly skilled, "involved" worker implies new patterns of labor and management communication.

Relationships among separate businesses will change significantly. Buy and supply relationships are becoming sophisticated learning systems, teaching partners about changes in markets and technology.

Workplace

Important trends of change are underway in the workplace, in the location and composition of jobs by sector. Most of our attention has been focused on the shift of jobs from manufacturing to the non-goods sectors of the economy, particularly to the services sector. But the notion that the U.S. economy is shifting from manufacturing to some sort of post-industrial, service economy is wrong and illusionary. It has diverted our attention from a far more consequential trend of change underway in our economy. This is a shift in the workplace from the large establishment to the small one.

The shift of jobs from large to smaller plants is a national phenomenon. In Indiana, it is occurring at roughly twice the national rate. While this obviously reflects our large branch plant heritage, the rapidity of this job shift -- which is accelerating each year -- has enormous consequences on our economy and profound implications for our policy. The strength of our past economy was derived from huge steel mills and auto plants. In the future it will come from thousands of small businesses.

Work Force

Over the past few decades the U.S. work force has grown very rapidly as the "baby boomers" and women entered the work force in huge numbers. However, the annual increase is slowing rapidly.

The movement of the "baby boom" generation through the age structure has had huge effects on the United States at every stage in the maturation of that generation. School systems were the first institutions to undergo wrenching change as huge numbers of young people entered our elementary, secondary, and post-secondary institutions in the 1950's and 1960's. Then, as this group moved into the labor force in the 1960's and 1970's, the economy adjusted to assimilate record numbers of new job entrants.

Over the next twenty years, that huge group will move through their middle years toward senior citizen status. The trend toward diversity of demand will likely accelerate as the "baby boomers" reach their years of peak affluence and purchasing power.

Even more profound changes are in store for the structure of the work force. As workers age, they become more experienced and less mobile. They also may tend to become more concerned with issues of seniority and security and less inclined to be flexible and risk-taking in their approach to their employment. Of particular concern to much of the country is the growing evidence that this huge generation of workers may not be particularly well-educated.

In the 1950's and 1960's, schools were preparing young people for an employment environment which did not reward skills of critical thinking, problem solving and teamwork. Assembly lines and job specialization

discouraged flexible learning skills. Schools have been slow to recognize the changing demands of the workplace and slower still to revamp curricula and approach to reflect the requirement of the modern economy.

Our ability to improve the skill level of the future work force by dealing only with new job entrants is sharply constrained by the demographic realities. About 80% of our nation's year 2000 work force is in the work force today. The next several years will see a continued sharp decline in the number of young workers entering the work force.

If we expect to enhance significantly the quality of our future work force, we cannot be content to concentrate only on improving the preparation of new job entrants. There simply will not be enough of them to make a difference. We must also strengthen the foundation of learning skills and technical skills of adults already in the work force.

The economic trends toward market niching and internationalization, toward customized, quality-based products, toward flexible process and advanced technology, toward decentralized, nimble business structures and interdependent relationships, and toward smaller scale establishments all have clear, easily predictable implications for the work force. Workers need to possess higher level thinking skills: they must reason, solve problems and work cooperatively. Because the workplace will depend more heavily on technology, they must have stronger math and science skills. Because both production and marketing are globally integrated, they must have an international perspective. We know the attributes of the successful worker. The issue is how well we prepare workers for success. Not all workers will have high-tech jobs. But they will all live in a high-tech world.

Social and Cultural Change

Divergent consumer tastes as discussed earlier are the outgrowth of a social revolution which has paralleled changes in the modern economy. The key attribute of this revolution is the drive toward diversity. Heterogeneous lifestyles, workstyles, values and preferences for living environment will shape both business and government response.

Contributing to cultural diversity will be a growing racial, ethnic and foreign component in our population. Racial minorities are the fastest growing sector of our population. "Internationalization" of the economy, coupled with emerging labor shortages, can be expected to spur immigration. While the U.S. may no longer be a "melting pot", we can anticipate a more culturally diverse and cosmopolitan future.

In the emerging new economy, lifestyles and workstyles will be virtually unlimited. Leisure, arts and culture, personal fulfillment and education for personal enrichment will compete with the old drudgery of work. A plurality of lifestyles calls for a variety of living environments, of alternative housing and neighborhood settings. However, the general direction of this trend is toward an enhanced quality of urban life. This should be reflected particularly in low crime, affordable housing, safe drinking water, affordable health facilities, access to nature and parks, recreational facilities and enjoyment of the arts and culture.

Implications

The components of world-wide economic and social change that I have outlined present the U.S. with a massive challenge. They also offer unprecedented opportunity. Many of these trends of global change will find us advantaged vis-a-vis the rest of the world. Some of our historic assets of location, extensive industrial infrastructure, a strong work ethic, community-based support systems and a respect for manufacturing skills will pay dividends in the years ahead. We have always been good at growing things and making things. We can continue to derive wealth from our natural resource base and from manufacturing. Americans should not worry that forces out of their control are molding us into some kind of "post-industrial" society where our historic assets count for nothing.

On the other hand, we can have no illusions about the immensity of change which is before us. These trends are not just possible occurrences. They are deeply rooted forces already underway and gathering further momentum. We at the state level cannot hope to change them and you at the federal level should not try. The restructuring of the global economy will wash over us no matter what we do.

These trends suggest the need to shift the focus of our state development strategies from the individual firm to the sector of the region within which that individual firm operates. We must seek to encourage cooperation among small businesses -- to help them learn how to manage their relationships as well as they are learning to manage their markets, their production, their technology.

Flexible manufacturing networks offer a way of understanding and encouraging the collaborative behavior essential to small, vertically dis-integrated companies selling complex, custom-tailored and quality-based products into a highly niched, international marketplace.

Small companies will have difficulty sensing changes in the market. Small companies will have difficulty understanding and adapting new technology. Small companies will have difficulty managing the complex array of administrative activity expected of them by governments seeking to protect workers, consumers and the enviornment. To help small companies overcome these difficulties other than by trying to become big companies, we must be prepared to let them cooperate and to encourage them to collaborate.

We have identified three major barriers to rapid adaptation of network models in the U.S. First, the majority of small firms in the U.S. may not know that they have a reason to change behavior. They may not see the same international economic trends that we do or they may not see them in quite the same way.

Secondly, these small firms may not see the possibility of change. They may lack the vision (or even the time to imagine) of how things could be different.

Thirdly, small firms are subject to important legal and administrative obstacles to the cooperation that is essential to the emergence of network behavior.

There is, I believe, an important federal role in helping to remove all of

these barriers. The federal government can seek to elucidate more clearly than it has the nature of world-wide economic change. It can do that outside of the partisan political demagoguery that too often passes for issue analysis within the federal government.

The federal government also can help to create a shared vision of how things could be different. This committee could make perhaps its most significant contribution by giving a forum to these notions through hearings around the country.

Antitrust Issues

I am also convinced that the federal government could contribute significantly to manufacturing network development through changes in anti-trust law. I have had recent occasion to discuss the antitrust aspects of flexible manufacturing networks with small business owners and with highly qualified attorneys specializing in this field. As a result of these conversations, I am convinced that present antitrust law and doctrine can be used to show that flexible manufacturing networks are legal (even among actual or potential competitors) where:

1. the participants in the network each contribute capital, know-how, technology, or other inputs, and all share the risks of loss and potential for profit;
2. the combined market shares of the participants within relevant product and geographic markets are relatively modest (e g., less than 30%); and,
3. any collateral restraints on the participants (e.g., limiting marketing territory or sales efforts, or setting prices of related products) are reasonably necessary for achieving the goals of the network.

However, antitrust laws have so deeply (and successfully) permeated the business culture that many businesses are understandably nervous about entering into cooperative efforts of any kind with their competitors. Not only have their attorneys warned them about the potential criminal liability arising from horizontal restraints on trade, but they are familiar with the risks, costs, and business disruption that civil litigation can entail.

Although antitrust doctrine is sophisticated enough to distinguish between good and bad joint ventures in theory, neither businesses nor their attorneys can be confident that any litigation risks of even procompetitive cooperative arrangements with their competitors (e.g.,, flexible manufacturing networks) are low. The law of joint ventures is not yet widely known among judges of attorneys who might represent potential plaintiffs challenging such arrangements. With its offer of treble damages and attorneys' fees for successful plaintiffs, federal antitrust law is specifically designed to invite litigation.

It seems impossible to quantify the extent to which the federal antitrust laws are now discouraging procompetitive, innovative arrangements such as flexible manufacturing networks. Clearly, however, many small businesses see this as an almost insurmountable obstacle to cooperation.

Protection from the threat of private treble-damage litigation could be

the best assistance the government

It is virtually impossible to quantify the extent to which the federal antitrust laws are now discouraging procompetitive, innovative arrangements such as flexible manufacturing networks. Clearly, however, many small businesses see this as an almost insurmountable obstacle.

Protection from the threat of private treble-damage litigation could be the best assistance the government could provide for flexible manufacturing networks. A model for such protection is the National Cooperative Research and Development Act of 1984 (Publ. L. 98-462, 15 U.S.C. 4301 - 4305).

A flexible manufacturing network could file with the Justice Department or the F.T.C. a notice describing the proposed arrangement with appropriate supporting documents. Under the simplest approach, if the government did not question the proposed arrangement within a specified time period, the arrangement would be considered immune from treble-damage liability for activity within the scope of its notice to the government.

I would also like to take this opportunity to raise the possibility of state action in this issue. Even without federal action, the states could experiment with their own form of antitrust immunity for procompetitive flexible manufacturing networks. Under the state action doctrine of federal antitrust law, the state may choose to sanction even blatantly anticompetitive conduct so long as the state makes a clear policy choice and engages in some degree of supervision of the conduct.

Under this doctrine, it would be possible for a state to establish a mechanism for approving flexible manufacturing networks subject to appropriate policy criteria. If the state's approval were subject to some form of potential administrative or judicial review, it is likely that the federal courts would find the state's approval to satisfy the requirements of the state action doctrine, providing a complete immunity from any federal antitrust liability.

There might well be constitutional limits on the extent to which a state could extend its authority over conduct outside its own borders. However, as long as a state is operating within its constitutional sphere, the state action doctrine offers an intriguing mechanism for a state to experiment with antitrust protection for Flexible Manufacturing Networks. Given the creativity and risk-taking which have characterized state economic development programs over the past few years such state action seems quite feasible, perhaps even likely.

Thank you very much for the opportunity to discuss these issues with you today.

WRITTEN TESTIMONY

MICHAEL HASLER, PRESIDENT

FLINT RIVER PROJECT

for

HOUSE SUBCOMMITTEE ON SMALL BUSINESS

September 13, 1988

OUTLINE

I. Introduction

1. Background

II. Problem Definition

1. Why are small manufacturers competitive?
2. Why are markets for small manufacturers eroding?
   a) Industry restructuring
   b) Foreign competition
   c) Technological change
   d) What stops small manufacturers from finding new markets?
3. Manufacturing Infrastructure
   a) Defense Preparedness
   b) Industry Preparedness (Automotive restructuring)

III. The Flint River Project

1. Mission
2. Organizational Structure
   a) RDLP
   b) Organizational Flexibility
   c) Core Staff Functions
3. Comparison to the Italian Model
4. Target Markets
5. Where do we stand?

Good Morning!

My name is Michael Hasler and I am the President and CEO of Efficient Enterprises, Inc. of Troy, Michigan. My company is a holding company for manufacturing firms that become part of our team through acquisition or start-up. In this function I am now actively involved in the management of a metal stamping company in Jackson, Michigan.

Most importantly for today, I am part of the founding team of the Flint River Project. This project is an effort to create a network of small manufacturers in the I-75 corridor of Michigan - a region extending from roughly Detroit to Saginaw. This area contains one of the highest, if not the highest, concentration of small manufacturing firms anywhere in the country. It should come as no surprise that the bulk of this manufacturing activity is dedicated to supporting the auto industry.

Prior to my affiliation with Efficient Enterprises, I spent twelve years with General Motors Corporation in a variety of positions that included: purchasing, manufacturing, manufacturing engineering, and product design. While at GM, I participated as one of the founders of the National Center for Manufacturing Sciences in Ann Arbor, Michigan - an organization dedicated to improving America's manufacturing competitiveness through cooperative research in the manufacturing technology field.

It was through my experience at General Motors, along with my present endeavors in acquisition and turn-around situations involving small manufacturers, that I became intimately familiar with the problems facing small manufacturers in today's highly competitive international business environment.

What I have experienced is that the small manufacturer in Michigan can be competitive with virtually anyone in the world in his particular niche of manufacturing skills. Many of these firms were founded by skilled tradesmen or individuals with years of experience in their area of manufacturing expertise. They can be competitive primarily because of their low overhead and their focus on a narrow range of manufacturing processes. They do not carry the large staffs of engineers or marketing or financial people that many larger firms have. Today's small manufacturer is the true lean corporation that is the goal of so many large firms undergoing restructuring.

What I have also seen is that many of these manufacturers are facing traumatic changes in the business environment that threatens their very survival. What makes the situation especially difficult is that many of these factors are beyond their control.

One example of these changes that I have seen firsthand from both sides is the restructuring of the supplier community in the automotive industry. As part of their efforts to improve their product quality and reliability, all of the "Big 3" automakers are reducing the number of suppliers with whom they deal directly. The automakers are merely responding to competitive pressures that require tighter control of incoming material to insure the quality of the final product. However, the result of this trend is that many small, highly capable firms are being eliminated as direct suppliers. Although it is likely that the need for their manufacturing skills will still remain, they will not be selling to the automakers but will become second or third tier suppliers over time. The critical question is whether or not many of these firms will be able to adjust the way they do business. The resources that these firms need to

survive are technical skills, marketing expertise, and financial sophistication; the same overhead expenses that they were able to do without in the past. What was once a competitive advantage has now become a competitive liability.

The scenario I just described is not limited to the automotive industry. In fact, the Department of Defense has begun a number of programs to encourage greater participation by small manufacturers in the defense procurement process. The key concern of the Pentagon is the erosion of the manufacturing infrastructure leading to a weakening of Industrial Preparedness in time of conflict. Even though the Department of Defense deals primarily with large contractors, they are acutely aware of the need to maintain a healthy supply base of small firms. In many cases these small firms handle the majority of the actual fabrication of the components that go into the large, sophisticated weapons systems. The large major contractors are merely the assemblers of the components built by the base of small manufacturers.

The Flint River Project, which has been in development for over a year now, has been formed to coordinate the efforts of a number of highly capable smaller manufacturers while seeking out new markets and opportunities for the network.

As our mission statement describes it:

> The Flint River Project will create a network that enables our manufacturing partners to become increasingly cost competitive in their present markets. In addition, FRP will help MP's expand into new product

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lines and broaden their customer base. This will be accomplished by providing access to marketing services and manufacturing and product engineering support through the network coordinator.

The organization is being structured as a Research and Development Limited Partnership, taking advantage of the Cooperative Research Act of 1984. The General Partner in this structure is Flint River Project, Inc. and the Limited Partners will consist of both Manufacturing Limited Partners and Investment Only Limited Partners. The General Partner will provide the engineering and marketing resources for the network. These are the very resources that the small manufacturer needs for growth, but often cannot afford.

The various roles in the network are clearly defined. The General Partner, or Coordinator, is responsible for developing new business for the network and coordinating the project through the many stages to completion. The Manufacturing Partners will be responsible for quoting competitively on their portion of the project and working as a participating member of the project team brought together by the Coordinator.

The competitive advantage that should be enjoyed by the Flint River Project is the same as that experienced by other networks. The network will allow the organization to tailor itself to the needs of a particular project. This concept will allow the network to utilize already existing capital assets, manufacturing skills, and under-used capacity. The alternative requires a substantial investment in capital equipment and employee recruiting and training to match the resources available through the network.

The structure we are proposing has similarities with and differences to the Italian model. The obvious similarity is that our network intends to make use of a group of small manufacturers acting in concert to produce complex goods and assemblies that they could not produce individually. We also see the Coordinator assisting the network and its Partners in entering new markets and adopting new technology.

As there are similarities, however, there are also some important differences. The key difference seems to be the existence of the Coordinator as a formal entity where no such function exists in the Italian model. The ability to coordinate production and the flow of material has developed over decades in Italy. Our contention is that here in the States, a network approach to business is a significant departure from the norm, and we simply do not have the time available to allow a network to evolve naturally. It is our understanding that in the Italian network its members do virtually all of their work through the network. In the Flint River Project model, our goal is to provide incremental work to enhance, but not supplant, existing business for our members. Our mission is to allow our partners to better utilize their existing base of capital equipment and skilled labor to provide a competitive product and an increasing number of quality jobs.

We intend to seek opportunities in the automotive, defense, and heavy equipment markets, primarily in low volume specialty and replacement part markets. At this time we are completing an in depth feasibility study. We are being supported in this effort by the Michigan Modernization Service and its director Dr. Jack Russell. At present we are seeking sources of further start-up funding both from the state and private parties. The research we have done to

date indicates that the community of small manufacturers in the I-75 corridor region of Michigan is quite receptive to the concept and we have begun initial recruiting of potential Manufacturing Partners.

We feel that the time is right for the concept of flexible manufacturing networks, and I would appreciate any support that the Federal Government could provide for ventures such as ours, now and in the future.

Thank you for the opportunity to speak with you today, and I hope that I can provide some insight that will be of value to this committee. I welcome any questions you may have about Flint River Project or flexible manufacturing networks in general.

FLINT RIVER PROJECT
MISSION STATEMENT

THE FLINT RIVER PROJECT WILL CREATE A NETWORK THAT ENABLES OUR MANUFACTURING PARTNERS TO BECOME INCREASINGLY COST COMPETITIVE IN THEIR PRESENT MARKETS. IN ADDITION, FRP WILL HELP MP'S EXPAND INTO NEW PRODUCT LINES AND BROADEN THEIR CUSTOMER BASE. THIS WILL BE ACCOMPLISHED BY PROVIDING ACCESS TO MARKETING SERVICES AND MANUFACTURING AND PRODUCT ENGINEERING SUPPORT THROUGH THE NETWORK COORDINATOR.

FLINT RIVER PROJECT
LOCATION

I-75 CORRIDOR STRATEGIC ADVANTAGES

- AVAILABLE SKILLED WORKFORCE
- UNDERUTILIZED WORKFORCE
- UNDERUTILIZED FACILITIES AND EQUIPMENT EXIST IN MANY COMPANIES
- MAJOR EXPRESSWAYS EXIST NS/EW
- UNDERUTILIZED MAJOR AIRPORTS
- HIGHEST CONCENTRATION OF APPROPRIATE MANUFACTURING SKILLS IN THE NATION
- COMMUNITY RECEPTIVE TO CHANGES AND INNOVATION IN BUSINESS RELATIONSHIPS

FLINT RIVER PROJECT

TRENDS IN AUTOMOTIVE PROCUREMENT

- SUPPLIER REQUIRMENTS TO BECOME "TIER 1"
  - TECHNICAL RESOURCES
  - CAPITAL RESOURCES
  - MANAGEMENT DEPTH
  - PROJECT MANAGEMENT CAPABILITIES

- SUPPLIERS NOT MEETING TIER 1 REQUIREMENTS WILL NO LONGER SELL DIRECTLY TO OEM'S.

- EXCESS WORLDWIDE CAPACITY IN FABRICATION AND ASSEMBLY
  - WE ARE IN THE MIDST OF A SHAKEOUT

- FOR MICHIGAN SUPPLIERS, INCREASED COMPETITION FROM OVERSEAS FIRMS AND TRANSPLANT OPERATIONS.

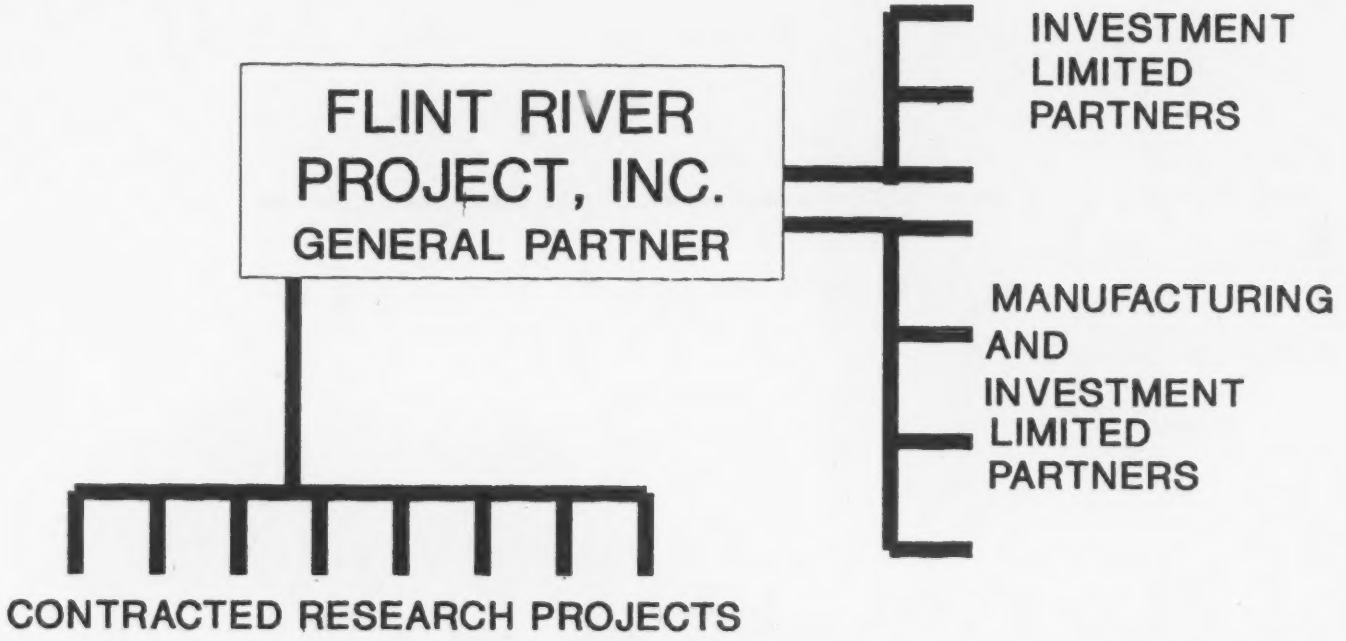
- MARKET MOVING TO SMALLER, SPECIALIZED NICHES: EMPHASIS ON MANUFACTURING FLEXIBILITY AND RAPID RESPONSE TO MARKET SHIFTS.

FLINT RIVER PROJECT

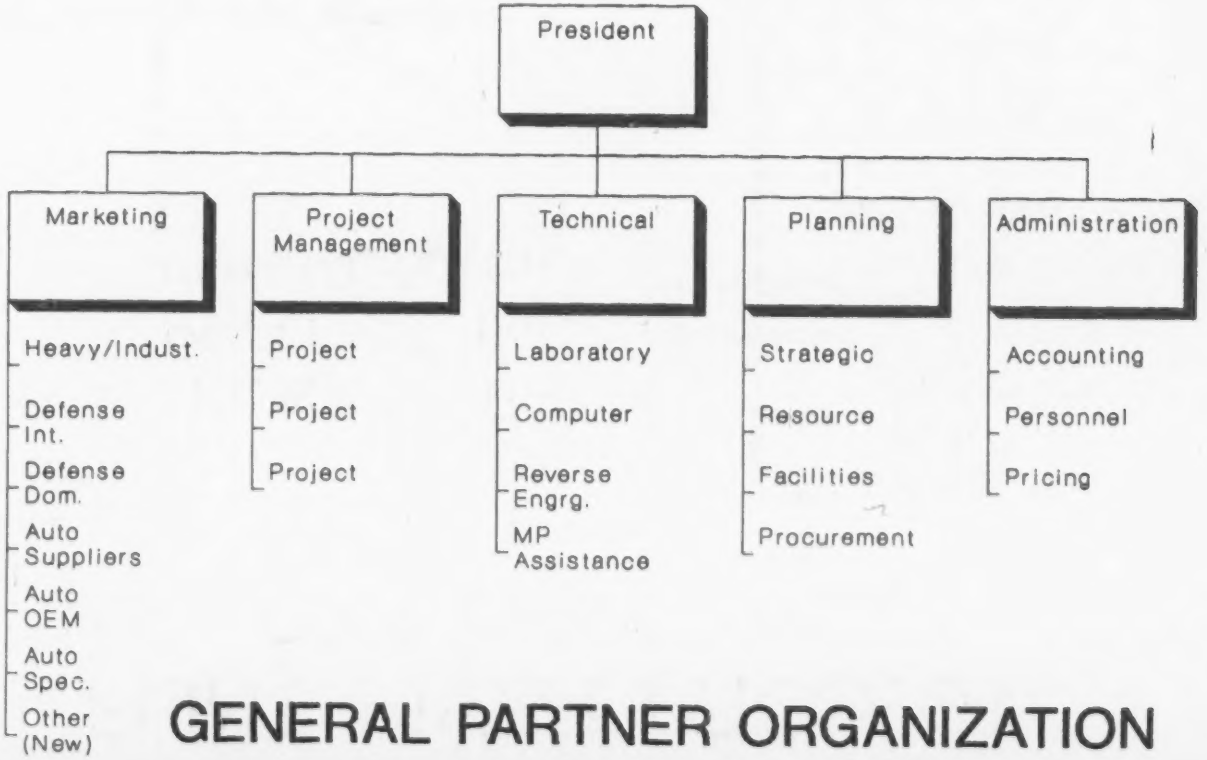
TRENDS IN DOD PROCUREMENT

- SHRINKING PENTAGON BUDGETS
- NEW DOD EMPHASIS ON INNOVATIVE PROCUREMENT PRACTICES...COSTELLO
- GREATER EMPHASIS ON SUPPLIER COMPETITION FOR REPLACEMENT PARTS
  - REPLACEMENT PARTS PURCHASE OR BORROW (RPPOB)
  - REVERSE ENGINEERING
  - VALUE ENGINEERING COST REDUCTION PROGRAM
- SIGNIFICANT REPLACEMENT PART OPPORTUNITIES WITH ALLIED NATIONS

FLINT RIVER PROJECT
RDLP STRUCTURE



FLINT RIVER PROJECT



GENERAL PARTNER ORGANIZATION

PREPARED STATEMENT OF ELIZABETH EDERSHEIM, INDUSTRIAL CONSULTANT, NEW YORK CONSULTING PARTNERS, INC.

Thank you for inviting me to be with you today. I have been asked to describe my perspective on whether industry networking techniques should be used in the United States and where and how they might be best applied.

Let me first define what I mean by "networking." Networking is a formal linkage or alliance of companies with the objective of enhancing their international or global competitiveness. Now, let me tell you what I think makes for effective networking. Based on my experience, including my fact-finding trips to Europe, there are two key elements of effective networking. First and foremost, is its ability to get at the heart of what is making a group of companies uncompetitive internationally. Second, the network must represent an extended commitment, not just a "one time" mechanism for solving a "one time" problem.

I will explain a bit more about these two elements of effectiveness. First, "getting at the heart of what is making a group of companies uncompetitive internationally" means making improvements to the companies' cost/value equation: either by providing the same value at a substantially lower cost, or by increasing the value that is provided and maintaining the cost.

Let me illustrate the importance of this first element of effectiveness by describing a networking situation that failed to address the basic cost/value equation. In the 1950s and 1960s, the U.S. steel industry had the opportunity to move from open-hearth furnaces, in which they had heavily invested after the war, to the newer technologies of basic oxygen furnaces and continuous casting. While the industry did have a network of sorts in place, the focus was on protecting the status quo, rather than on enhancing the value they could provide via such actions as technology improvements. No firm needed to innovate because each knew that its competitors would not. As history went on to so vividly and unfortunately demonstrate, this protectionism was not effective over the long-term.

A more effective networking example is the Danish textile industry. Through networking, a multitude of companies were able to improve their cost/value equation by reducing their overhead via shared centralized resources - a relatively simple solution. By joining together, they were also able to gain access to resources that they never could have afforded individually - e.g., a joint training center. In this manner, they were able to attack both sides of the cost/value equation.

As regards the second element of effectiveness, for the network to be more than a "one time" thing, the participants must be willing to continue to use the networking approach to make other changes as new needs arise. For example, a network

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was formed for the machine tool industry in Italy that initially helped this group of companies adapt to the microelectronics age, thus enhancing the value they could deliver. More recently, as the industry environment again changed to include a requirement for greater flexibility in equipment, top management and owners of the group of companies had a strong enough commitment to the network to use it effectively again.

Enough industries or groups of companies in enough countries have been revitalized through effective networking for me to feel comfortable that this is a powerful tool - one I believe must be used in the United States.

So, in my mind, the basic issue is not whether we should apply this concept in the United States. Rather, it is where and how we should apply it. Accordingly, in the remainder of my talk, I will focus on where I believe the concept has been applied most successfully - including applications in the United States. I will also suggest other industrial sectors in the United States where I believe it can provide the greatest benefits. I will then suggest critical aspects of roles to be played by the federal government, the networking entity, and the private sector in effectively applying this concept.

WHERE HAS NETWORKING BEEN EFFECTIVE

While I have seen or heard about effective networking in a wide range of applications, the most discussed and written about are the regional cooperatives in Europe. Over and over again, these cooperative efforts have proven to be successful in helping the participating companies improve their global position.

For example, the textile cooperative formed in 1980 in the Emila Romagna region of Italy helped a shrinking industry regain and sustain its competitive position. The co-op initially focused on providing managerial training and up-to-date information on global markets and advances in fibers and production machinery. From these initial efforts, the co-op members became better equipped to identify world-wide market needs. The co-op remains an important entity, and management at the various companies involved is well aware of the continued need for this co-op. At a party I attended for members of the co-op, I was both impressed and surprised by the high number and level of attendees. Companies did not send representatives - the owners were there. And they demonstrated a sense of pride in and responsibility to the co-op. The co-op continues to use group meetings and technology demonstrations as the preferred mode of communication. In fact, increased contact between producers is very high on the list of co-op objectives; there is a sense of mutual trust and respect. It is felt that emulation and peer pressure combine to provide the most powerful impetus

to modernization. The members recognize that the knowledge of each others' capabilities leads naturally to increased subcontracting between firms.

Networking is also used extensively in Japan, where this type of activity is ingrained in the culture. Here, the mechanism for networking is the industry groups - the Zaibitsu. In many cases, networking has been very successful. For example, networking has enabled Japanese electronics companies to make greater investments in state-of-the-art components and processes than would have otherwise been possible. Consider the small Japanese company involved in the manufacturing of advanced medical equipment. This company purchased a huge quantity - effectively a controlling position - of a risky advanced circuit. When asked how they could afford to take such a risk, the equivalent of the CEO replied, "it was no risk, when technology takes its next step, I will pass these chips on to another company in the association, such as a consumer electronics company, that does not need to be utilizing the absolute state-of-the-art chip. There will be no waste."

In the United States, a smattering of state and federal programs have initiated what might become effective networks. There have also been some industry-initiated efforts.

A number of the state programs you have heard about today: the knitwork industry in Ridgewood, N.Y; the Machine Action Project in Springfield, Massachusetts; the automobile parts industry in and around Detroit, Michigan; and the community bank in Arkansas.

The federal government is also taking actions that inadvertently encourage cooperation in some industries. For example, in the aircraft industry, the federal government is forcing cooperation among military suppliers by sourcing systems, rather than components. As a result, suppliers must work together in order to integrate the components - e.g., transmission and engine - into a working system or powertrain. There are currently a substantial number of cooperative technology investments underway, suggesting that the military aircraft industry is beginning to cooperate and function more as a network. Unfortunately, a number of the suppliers of commercial aircraft components are not part of this network; the network appears to be much stronger on the east coast (e.g., with companies like G.E., Pratt and Whitney, Textron Lycoming) than on the west coast, where 60% of aircraft parts are produced.

Finally, I have seen a few effective networks established by large U.S. companies for their suppliers. For example, Johnson & Johnson's Just-in-Time program (an inventory management and production flow program) presented J&J with a

good opportunity to bring its suppliers together, which then led to an ongoing network. J&J brought major competing suppliers together to enhance their capabilities, with the end result improved service to J&J and better systems capabilities on the part of suppliers. The supplier association that was created from this effort continues today, meeting once a month and with a variety of both J&J sponsored and off-line training and technology programs.

In summary, I have seen effective networks in Europe, Japan, and, more selectively in the United States. However, I feel that there are many more opportunities to use this tool in the United States, and in some industries, I think networking is a necessity.

WHAT INDUSTRY SECTORS IN THE UNITED STATES ARE MOST IN NEED OF NETWORKING

I would suggest that networking be applied in the United States exclusively on a narrowly targeted, industry-specific basis. There are obvious places where networking is simply not needed. For example, in the packaged goods industry, there is no reason to network Proctor and Gamble with Colgate Palmolive and Bristol Meyer. These companies are already world-class competitors.

This concept ought to be applied where it will make the most difference and have the greatest chance of succeeding. There are four industry characteristics that I believe should be used as criteria in deciding where networking should be used. Basically, the industry should:

1. Have a high level of international competition, indicating both a strong need and high likelihood that the participants will be willing to support the network

2. Be in a state of transition as regards products, processing technology, or marketing requirements, indicating that there are real opportunities to improve the cost/value equation.

3. Have been effectively networked elsewhere in the world, demonstrating that the particular industry can benefit from networking

4. Be important to the United States.

When I think of these characteristics, I believe that there is no better industry to focus on first than the semiconductor industry. It is intensely competitive; it is approaching maturity; there is significant overcapacity worldwide; and it is global. Both its products and its

manufacturing processes are in a state of transition. Third, the basis of competition has already been fundamentally changed as a result of effective networking in Japan. Finally, it is a critical industry for the United States. In fact, I would be so bold as to say it is to the United States today what the steel industry was in the 1920s. Although in absolute dollars the domestic consumption of semiconductors is not huge, only $30 billion, the number and variety of industries built around semiconductors is: it exceeds $400 billion and includes elements of national defense. It is also an industry in which the position of U.S. suppliers is clearly deteriorating. The Japanese preeminence in mass-produced integrated circuits is frightening. A mere 2 years ago, U.S. companies held the number 1, 3, and 4 positions in this industry. Today, the top three positions are strongly held by Japanese companies - NEC, Toshiba, and Fujitsu.

Linking small and large U.S. companies in the semiconductor industry could effectively give them access to every important industry skill and accelerate their ability to enhance value for their customers, as has occurred in Japan. In Japan, networking not only links large Japanese semiconductor manufacturers, but also links these companies to their smaller suppliers. This type of networking provides the Japanese manufacturers with an infrastructure that permits lower product costs and greater value due to faster development times and creates a strong competitive advantage worldwide.

In the United States today, there are no formal working linkages between the equipment and chip-producing companies, a source of increasing frustration for the equipment makers. Essentially, this lack implies that, relative to their Japanese competitors, American semiconductor companies are inflexible and isolated. For example, the ability to load and unload the semiconductor wafers from the processing line has not been competitively integrated in U.S. equipment - resulting in downtime, awkward startup, and changeover time at U.S. companies.

Perhaps in response to this situation, some cooperation has begun to occur in this country. For example, the Semiconductor Industry Association has put together a consortium. However, it is too narrow in its membership - it does not include material or equipment companies. Moreover, while it states that its objective is to facilitate the exchange of research, it does not call for true collaboration.

As another example of the cooperative effort in the U.S. semiconductor industry, Intel has been collaborating with other companies, e.g., with Cypress to facilitate the integration of Cypress Cash Chip - or fast memory access - with Intel's powerful 80386 processor. But, this is an isolated instance and again excludes equipment and material companies.

In addition to the semiconductor industry, several other industries in the United States have the characteristics that I feel are important for effective networking. These include the machine tool industry, the heavy equipment industry, the industrial rubber industry, and our fragmented commercial banking industry. There are, of course, also substantial and important opportunities to network at a more local or regional level some of which you have heard about earlier today.

HOW CAN NETWORKING BE USED MOST EFFECTIVELY IN THE UNITED STATES

For networking to be really effective in these and other industry sectors in the United States, we need to overcome a number of barriers. We do not have the history of cooperation that Europe has - nor is the notion of working together with those perceived as competitors a convention here, as it is in Japan. And, of course, we have a variety of legal issues pertaining to anti-trust.

I am not equipped to address what needs to be done to deal with the legal barriers. However, I would like to emphasize that fear of legal repercussions has truly hindered networking in the United States. I have seen conversations cut off, and individuals (including a Mayor) walk out of rooms because of this fear.

Beyond the legal issues, the biggest challenges in successfully developing networks in the United States will be in altering the culture of the companies involved and gaining public acceptance. At least initially, this means dispelling the notion of domestic competition. Today, competition in most industries is global. While this is certainly realized at some level (the "buy American" theme), I do not believe the international nature of competition has been internalized to the extent needed to overcome: (1) the fears on the part of companies that cooperation means giving away secrets and losing some proprietary edge; and (2) and the fears on the part of the public and our public guardians that joining together means monopolistic pricing.

It is clear that some early and highly publicized winning efforts will do a lot to raise the public's awareness of the power of the networking tool and its benefits to the United States. Early successes should also be effective in breaking down private-sector concerns. In short, if management and employees can see a bottom-line benefit without the threat of giving up proprietary information (or gaining legal liabilities) and if the public can see a more competitive industry without monopolistic pricing, I believe that the needed cultural changes and public acceptance will begin to occur.

As such, the first critical task for the federal government is the selection of industry sectors that can most benefit from networking. Then, the government, the networking agency, and the participants each have critical roles to play to ensure its success over time.

In selecting industry sectors for the next networks (and, keeping in mind the need for early successes), I believe the government should review industries against the characteristics I outlined earlier - internationally competitive, in a state of transition, effectively networked elsewhere, and important to the United States - as well as against the manageability of the task considering the size of the industry and the particular players. Once the industries are selected, the government's role becomes a delicate balance of supporting and focusing the network while not intervening in the private sector. The government needs to invest or find investments for the network, build public awareness of the program, encourage academic participation, encourage high-level involvement by industry participants, prod the network on occasion, and possibly help in the selection of a leader for the network association. From what I saw in Europe, the government by-in-large selected the initial leader of these co-ops.

I cannot overemphasize the importance of selecting the right person for this position and ensuring his/her independence. Ideally, the leader for the network association should have had hands-on experience with the industry but currently have no ties to the industry to avoid any concerns about bias and be perceived as a catalyst for constructive change.

As regards the role of the network itself, from having spoken to the leaders of a number of networking organizations in Europe, I believe that the network must view itself as an enabling agency - one that facilitates the actual linkages rather than merely assuming them. There seems to be consensus by those who have built effective networks that, early on, it is important to focus the effort on some specific aspect of the operation that can enhance the cost/value position of its members, and build the commitment of the high level management of member organizations.

Some tasks that have helped other networking agencies with these objective include:

- Building a library of industry and company information and putting in place systems to support easy and rapid access to that information.

- Developing a formal communications and linking strategy, targeted at providing a broad spectrum of individuals at member companies with material of interest and bringing them together.

- Gaining agreement on key services to be provided - value-added results that have both immediate payback and sustaining impact.

- Lastly but not least - establishing a solid method of financing. Possibly seek venture capital leveraging government programs. charging members dues . . . The majority of co-ops I visited in Europe began with some form of seed money and low dues, and between 1-1/2 and 3 years later became financially independent and charged greater dues from committee members.

  In one instance, a network of small metal working firms badly needing to invest in new equipment is said to be pressuring its existing banks to provide Letters of Credit on public debt facilities or to provide subsidized, secured third-party lease facilities thereby lowering the members' cost of funds.

Finally, key aspects of the role of participants are to challenge and test the service the network will provide early and ensure that their competitive ability is being addressed and enhanced. They also need to overinvest in getting to know their counterparts at other member organizations. A level of openness between companies needs to be established that may be unprecedented and initially uncomfortable. Companies must explicitly sort through what can and cannot be shared. And, the exchange must begin at the top but include individuals throughout the organization. Finally, for this marriage to last, it is critical for participants to be patient.

CONCLUSIONS

In closing, I want to reiterate that the key to the health of the United States is the ability of U.S. companies to compete in the international marketplace.It is clear to me that in other countries some form of networking has enhanced that ability. I hope the importance of this tool becomes more recognized here at home and that necessary actions are taken to help ensure it is effectively leveraged in the United States.

Thank you,
Elizabeth Haas Edersheim

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U.S. DEPARTMENT OF COMMERCE
STATEMENT OF DR. JOHN W. LYONS, DEPUTY DIRECTOR
IN BEHALF OF RAY KAMMER

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY

BEFORE THE SUBCOMMITTEE ON REGULATION & BUSINESS OPPORTUNITIES

COMMITTEE ON SMALL BUSINESS

U.S. HOUSE OF REPRESENTATIVES

ON FLEXIBLE MANUFACTURING NETWORKS

SEPTEMBER 13, 1988

Mr. Chairman and Members of the Subcommittee:

I am Ray Kammer, the Deputy Director of the National Institute of Standards and Technology, formerly the National Bureau of Standards. In 1976 we began a research program in cooperation with industry to make flexible manufacturing networks technically feasible. My testimony this morning focuses on the information that we have gained in this 12 year effort.

A number of U.S. industries are not achieving the productivity increase of our trading partners. One of the sectors is that which manufactures discrete parts in small batches. This sector of our economy includes the machine tool industry, the automobile industry, the defense industry, and the aerospace industry. These industries are the backbone of our industrial complex and consist of some 130,000 enterprises in the fifty states, account for seventy-five percent of all goods in trade, and contribute some $300 billion to our Gross National Product. In these industries, part of the competitiveness problem is the failure of our firms to use the advances which are being made in automation to increase productivity, quality, and speed to market. The Manufacturing Studies Board of the National Research Council has pointed out

that this failure is particularly noticeable in the eighty-seven percent of the enterprises which employ fewer than fifty people. The Board also points out that smaller machine shops cannot afford advanced manufacturing technology and do not have the expertise to use it, regardless of the potential benefits.

The lack of expertise is not simply an issue of education. Automated manufacturing is an emerging technology which means that technological changes are occurring at a pace which is more rapid than that can be assimilated by the traditional small businesses in this field. The conventional mechanism for improving the level of technical sophistication for the small manufacturers is through equipment vendors. Incremental improvements are made in the newer products and the equipment manufacturers use these improvements to increase their sales and their market share. Today, however, the integration of machine tools and computers is stimulating changes in the industry which are so rapid that they can not be accommodated using these conventional methods. At the same time, the change cannot be ignored -- U.S. industry must use world class technology to improve product quality and responsiveness to the marketplace.

Three significant technical barriers to small-firm automation are

1. The lack of a way for large high-technology companies to communicate their needs to the less advanced small- and medium-sized firms who are their suppliers, in the form of computer-aided-design developed code that metal cutting machines can read with little or no human intervention.

2. Lack of commercially available systems tailored to the needs of individual small firms, and
3. Lack of "hands on" information or "role models" which provide the small shop owners with the practical information that they need to upgrade their shops effectively.

The first barrier, the lack of a suitable interface between the contractor and the subcontractors, is an area in which technical development as well as standards are needed. In a traditional shop mechanical drawings are used to communicate the desires of the designer to the mechanist who must fabricate the component. Today, and increasingly in the future, the designers in the larger companies are using computer-aided design, or CAD, systems. Efficient, cost-effective techniques to transfer the product description in the designer's computer to the computer which controls the tools on the machine shop floor must be developed and disseminated.

A very likely scenario for the automation of the small shop is the integration of affordable, free-standing, flexible manufacturing cells, but they do not yet exist. Development is progressing to remove this second barrier to small-firm automation. An excellent example of this type of research and development work is the workstation that the National Institute of Standards and Technology developed in collaboration with industrial research associates and with Navy money. This system can manufacture a family of forty different parts. The system reduces the average time to manufacture a part from seventeen hours to less than an hour. Without this system the Navy must inventory many million dollars of parts rather than

manufacture "parts on demand". This system will pay for itself less than two weeks.

There is a lack of practical guidance available for the small shop owner who wishes to learn how to automate, an important step in the process of deciding whether to automate. Reports of successful and unsuccessful attempts at small- or large-scale automation of small shops need to be disseminated widely to improve the quality of the decisions made by the individual shop owner.

Each of these barriers which we have been discussing has two facets which are relevant for the considerations in this hearing. First, removal of these barriers requires technology development and this development is occurring. The private sector as well as Federal and State governments are funding and conducting research and development in the area of advanced manufacturing. Individual machine tool, robot, computer, and software companies are developing products with new capabilities. At the National Institute of Standards and Technology, we are conducting research in cooperation with U.S. industry on the issue of integration of these components into effective manufacturing systems. To accomplish this work, we have developed and are using the Automated Manufacturing Research Facility. The facility provides a basic array of manufacturing equipment and systems that researchers from NBS, industrial firms, universities, and other government agencies can use to experiment with new standards and to study new methods of measurement and quality control for automated factories. The smaller businesses are particularly dependent on the development of technically sophisticated

standards which permit the evolution of the technology while assuring compatibility. These companies need to buy automated machinery in stages, one or two machines at a time, and slowly build up to an integrated system. They need the flexibility to buy from different manufacturers at different times with the assurance that the machines they buy will work together properly. They need the same flexibility that one now finds when buying the parts of a home stereo system from several different manufacturers, knowing that they will all work together.

Second, the technological developments must be made available to small businesses in a form which those businesses can assimilate. The Omnibus Trade and Competitiveness Act of 1988 has given the Department of Commerce important new responsibilities in this area. The Act directs the Department to establish Regional Centers for the Transfer of Manufacturing Technology. Through this program, the Federal government provides no more than fifty percent of the funding for each regional center. The centers are to establish automated manufacturing systems and other advanced production facilities to demonstrate capabilities, to transfer technology, and to loan equipment to small firms. The Act specifies that the centers are to pay particular attention to the dissemination of research findings to small- and medium-sized manufacturers. Competition for the first centers to be established under this program will close September 16, 1988.

The Act also requires a nationwide study of current State technology extension services. The study is to evaluate the success of these services to provide guidance on the development of methods for the Federal government

to provide technical assistance to the States in the conduct of successful technology extension services. The Act further permits financial assistance to the State services as part of cooperative agreements to increase the application of Federally developed technology.

The Department of Commerce is also to maintain a Clearinghouse for State and Local Initiatives on Productivity, Technology, and Innovation. This Clearinghouse is to be a central repository of information on efforts by State and local governments to enhance the competitiveness of American business.

A fourth new activity established by the Act is the Advanced Technology Program in the National Institute of Standards and Technology. This program is intended to assist U.S. business in the commercialization of new scientific discoveries and technologies and in the refinement of manufacturing technologies. The assistance is to be delivered primarily through joint ventures and contracts.

In addition to the Federal efforts to make the technology available to small businesses, there are mechanisms being promoted to allow the small businesses to equip themselves to become more productive. These fall under the general heading of flexible manufacturing networks. This Subcommittee has invited other witnesses which will discuss successful applications of these networks in more detail. The fundamental premise of these networks is that productivity and responsiveness to changing markets can be increased if small manufacturers cooperate by sharing some aspects of their business. A self-

contained small business must be concerned about production, marketing, quality control, personnel services, etc. Clearly, a strength of the small business is that, because the owner has complete control of all functions, the business is sufficiently flexible to respond to changing conditions. Complexity is increasing in all of these areas, however. The markets are moving from local markets to international markets. Conventional production technology is being replaced by computer-based production technology Quality control is moving from post-production inspection to the integration of quality into the manufacturing process. These changes are making it increasingly difficult for the small shop to remain competitive across the spectrum of business functions. A network of businesses allows one or more of these functions to be carried out jointly while preserving the benefits of the small independent shop. A group of shops working on related items for an international market, for example, may jointly market their capabilities to increase total sales. Similarly, a piece of automated production equipment may be too expensive for a single shop but could improve to productivity of all members of a group of shops if the purchase and operating costs were shared.

In summary, there is widespread recognition that small- and medium-sized manufacturers must change their method of doing business in response to a changing competitive situation and changing technology. Private, local, State, and Federal programs are in place to assist manufacturers produce higher quality products and be more responsive to changing market conditions.

RAYMOND G. KAMMER

Deputy Director
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As Deputy Director of the U.S. government's central laboratory for measurement and standards research, Ray Kammer manages a staff of close to 3100 physicists, chemists, mathematicians, engineers, and support personnel. His responsibilities include monitoring and coordinating all NBS technical projects and support services.

A graduate of the University of Maryland, Kammer joined NBS in 1969 as a technical program analyst. Over the following decade he served the agency and the U.S. Department of Commerce in a succession of offices concerned with budgetary and program analysis; planning; and personnel management. As Associate Director for Programs, Budget and Finance at NBS, he oversaw the first major reorganization of the agency in 14 years, streamlining management systems and operations, and instituting a new strategic planning system for the agency.

In 1980, Kammer was appointed Deputy Director, the second-highest position in the National Bureau of Standards.

In addition, Kammer has served as chairman of several important evaluation committees for the Department of Commerce, including reviews of satellite systems for weather monitoring and the U.S. LANDSAT program, and the next generation of weather radars used by the U.S. government. He is now serving a three-year term on the Board of Directors of ASTM, a major international organization for the development of voluntary standards for materials, products, systems and services.

His awards include both the Gold and Silver medals of the Department of Commerce, given for meritorious service to the Department and the nation, the William A. Jump Award for Exceptional Achievement in Public Administration, the Federal Government Meritorious Executive Award, and the Roger W. Jones Award for Executive Leadership.

April 1988

National Tooling & Machining Association

PRECISION

BEFORE THE

SUBCOMMITTEE ON REGULATION AND BUSINESS OPPORTUNITIES

OF THE

HOUSE SMALL BUSINESS COMMITTEE

STATEMENT

OF

MATTHEW B. COFFEY

PRESIDENT

NATIONAL TOOLING AND MACHINING ASSOCIATION

SEPTEMBER 13, 1988

WASHINGTON, D.C.

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I. INTRODUCTION

I am here today on behalf of the National Tooling and Machining Association.

Our industry has two distinctive characteristics. First, it is the backbone of all American manufacturing. Anything that is mass produced by machinery -- whether toasters, pens or silverware, rocket parts, car engines or computer keyboards -- is shaped by tools, dies, molds, precision machining and special machines. These custom designed and manufactured products are referred to as "tooling." The tooling is placed in our customers' production machinery such as presses and injection molding machinery, enabling production workers to rapidly manufacture thousands of precise and identical parts.

Without our "products" there can be no mass production. It was the creative genius of our predecessors in the 19th century that gave America its industrial might and pre-eminence. Today, our members are one of the nation's most technically innovative and advanced industries -- literally at the cutting edge of high-technology. And if America is to continue to have a domestic manufacturing capacity of any kind in the next century, then we must have the ability to create the tools, dies, molds, precision machining and special machines that allow our factories to work. There is no other service or product that is so essential to every aspect of American industry.

The second distinctive characteristic of our Association, and one that is particularly relevant to this Committee's deliberations, is that we represent the classic American "small business" industry:

- o 12,000 separate companies;
- o 80% under 20 employees;
- o typical firm has 8 or 9 skilled craftsmen, with 1 or 2 clerical support persons;
- o virtually entirely owner-operated -- a truly entrepreneurial industry.

There is probably no other manufacturing industry in America that has this "small business" profile -- a profile usually found in local retail and service businesses (cleaners, grocers, drug stores) not in manufacturing and production.

Our industry is highly fragmented because of the unusual nature of our manufacturing process:

- o customized - almost every job is a custom assignment to meet a special need, not susceptible to mass production;
- o industry specific - while heavily concentrated in such fields as automotive, defense and aerospace, our companies work for every industry and every American manufacturer -- collectively we cover the whole economy, but on an individual basis most of our firms tend to focus on niches in particular industries;
- o creative - our work often requires the development of innovative designs and new production techniques which involve extensive research and testing;
- o skilled - our workers are highly skilled craftsmen, trained in engineering, mathematics and technical design;
- o precision - we produce extremely complex close-tolerance products, regularly meeting standards of 1/10,000th of an inch -- equivalent to 1/30 the thickness of a human hair; and,

- o service - while we produce tools, dies, molds and precision metal parts, our customers are themselves manufacturers and we must respond to their frequently changing technical requirements.

Because of these characteristics, our business is not conducive to large-scale operations or remote management and will remain small-scale and entrepreneurial.

II. COMPETITIVE AND SELF-RELIANT

Because of the small size of our firms and the customized nature of our work, this has always been an extremely competitive industry. The 12,000 U.S. companies in the industry compete against each other and against foreign firms for each piece of business. As a result, there is constant pressure for quality work and cost effective innovation that continually selects the best-managed and most skillful firms for survival.

Our members are consequently independent, determined and self-reliant. They not only run every aspect of their own businesses, but they take personal responsibility for quality and service and for the economics of their firm. They have no one else to lean on, to turn to, or to blame. They are realists who must deal with changing economics and new technologies. And they accept the burden of adapting to change if they are to remain competitive and survive.

III. THE CHALLENGE

Our industry is in the process of massive changes which challenge the innovation, management skills, and financial

resources of NTMA's membership. The members are challenged to change their process technologies, which have undergone rapid conversion from old-line mechanical controls and mechanical cutting to computer-driven equipment including robots, laser machine tools and computer integrated manufacturing work cells. They are challenged to upgrade their already highly skilled work force to fit with the new technologies. They are challenged to adapt to the rapidly changing demands of their customers as those customers also undergo rapid technological change and a restructuring in the way they do business -- new processes, new materials, finer tolerances and specifications, and new business locations.

A final set of challenges comes from international competition. While there has always been some foreign competition in several sectors, over the past few years there has been a significant increase in both direct and indirect foreign competition. We have seen the competitive environment change rapidly and substantially because of three major factors:

- o The movement off-shore of major U.S. manufacturing facilities with the corresponding purchase off-shore of the supporting tools, dies, and molds;
- o The development of increasingly high-level technical expertise and skills by foreign firms (largely as a result of past U.S. policies to strengthen these foreign economies); and,
- o The favorable economics of foreign firms based on such factors as government subsidies, lower cost of capital, lower employee wage and benefit costs, fewer mandated costs imposed by government regulation and the development of flexible networks.

While our members welcome free and open competition, these factors have significantly changed certain segments of our industry. They have placed unrealistic capital burdens on our small, owner-operated businesses. Our industry now appears to be under intense attack from many corners of the globe -- molds and dies from Japan and Taiwan; molds from Canada and Portugal, and so on. Because we are so fragmented, dealing in thousands of narrow niches, our members are vulnerable to highly targeted attacks. And that is just what is happening. Our companies are being picked off on many narrow fronts simultaneously. These are specialized areas and it is difficult to get an aggregate picture of the magnitude of the assault. But it is happening every day. And because our members are each so small, they have little to fall back on if their major area of expertise and client base is undermined.

IV. FLEXIBLE NETWORKS

Flexible networks have been adequately described by previous witnesses. From our perspective they offer interesting possibilities to address significant competitive problems faced by small manufacturing businesses.

The rapid technological evolution discussed earlier has a big impact on small manufacturers. First, they have to be able to get access to increasing amounts of capital without increasing frequency, and second, access to training. Technological equipment is expensive. Average investment in equipment has gone from less than $100,000 ten years ago

to $2.2 million on average today. The main way most U.S. small manufacturers have been able to stay competitive is to take advantage of preferential terms and rates offered by foreign machine tool manufacturers. Current U.S. banking practices requires heavy collateralization on existing assets rather than equipment productivity. This has significantly limited the ability of small manufacturing companies to obtain loans for U.S. banks. Incentives for U.S. banks to invest in productive equipment should either be established by the Congress (i.e. loan guarantees) or negotiated by a flexible manufacturing network if other obstacles can be overcome.

Access to training is another barrier to start-up and expansion. There is a mismatch between graduates of training programs and real jobs that exist. Our industry is enmeshed in a national critical shortage of highly skilled workers. I want to add that the jobs we have are among the highest paying blue collar jobs in the country. Many of those journeymen will become the shop owners of tomorrow.

V. ANTI-TRUST CONCERNS

The paper prepared by the Congressional Research Service for this subcommittee on this subject raises the legal points of anti-trust law. There is, however, an emotional side to the anti-trust laws.

Most small businessmen know they cannot discuss pricing, division of markets, capacity and other domestic competitive

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information with direct competitors. The anti-trust lawyers have done a terrific job of putting fear into the manufacturing community. That fear has made American manufacturing companies less competitive, both in the U.S. and abroad, particularly against a European flexible network or Japanese Ministry of Trade Industry targeted industry development programs.

It is clear that if we are to encourage flexible manufacturing networks in the United States, Congress must take action to remove barriers presently imposed by the anti-trust laws. That action can be similar to the actions taken in the Export Trading Company Act and the Research and Development Consortium Amendments. This, of course, will be viewed as a major revision of the laws because a flexible network will require the sharing of capacity information, and pricing information in preparation of a bid. Since the networks will normally be bidding against large companies with extensive legal staffs, those companies will file anti-trust challenges as a means to prevent competition, unless the law is very clear.

This is obviously an issue requiring close examination in the Subcommittee on Monopolies of the House Judiciary Committee. We would be pleased to assist this committee in drafting proposals to be forwarded to that committee.

VI. OTHER AREAS NEEDING REMEDIES

Tax policy is a defacto industrial policy. When Congress eliminated both the investment tax credit and the accelerated depreciation provisions, it stifled investment in productive equipment. Let's face it, the 10% ITC represented a small manufacturer's down payment on a new machine. Without it, the employer has to finance the equipment out of retained earnings in an industry where profits may average 1 to 2% of sales. That is unrealistic.

Computer controls and automation continue to be enhanced, making the average life of computer controlled equipment 3 years rather than the minimum 7 year depreciation under current law. The law forces manufacturers to keep and use out-of-date equipment.

A. Equipment

To remain competitive, our members must invest in sophisticated new equipment, usually computer controlled, that can satisfy exacting performance standards and ensure cost-effective operations. This type of equipment is enormously expensive -- say $250,000 for one machine. That may be relatively insignificant for General Motors or IBM, but it's an enormous burden and exposure for our small owner-operators. Without the most modern equipment, our shops will not remain competitive in terms of quality, precision, price or cycle time.

These machines often have a surprisingly short useful life because they are frequently made competitively obsolete by newer, more productive equipment which is continually being developed. To deal with these problems, we urge enactment of:

- o a special investment tax credit to assist small businesses that lack a significant capital base in obtaining expensive high technology and computer-controlled equipment; and,
- o adoption of a revised depreciation schedule for computer-controlled machinery to accurately reflect the short life cycle of this equipment, which is much shorter than the seven years now allowed.

B. Manpower

The Congress appears to be focusing on increased programs to retrain workers who lose their jobs through foreign competition. That, of course, is critical.

But why wait until workers lose their jobs? In our industry, we see many highly trained and skilled craftsmen who lack the new expertise, particularly with computers, that will be needed in the years ahead. If these workers don't gain such skills, many will lose their jobs in the next few years.

We urge that Congress provide adequate funds for retraining current workers through tuition grants, training tax credits, and other support to gain the skills needed for their future survival in a changing technological work environment.

We also believe that there has been a built-in bias against small business in existing manpower programs. This is largely because of the ability of large corporations with a staff of human resource professionals to participate more actively in these programs to meet their regular on-going needs for large numbers of new employees. We have neither full-time human resource professionals nor ongoing hiring demands for each company. But our industry needs new talent -- serious, motivated people with solid technical skills who can survive the traditional four year apprenticeship needed to master our basic skills, and benefit thereafter from the excellent compensation available for our master craftsmen.

All major manpower programs, such as the JTPA, should contain a requirement that special attention be given to the needs of technology driven small businesses. That would help us satisfy our critical need for new talent. Moreover, a special emphasis is needed for training for high skills occupations or retraining for high skill innovations.

C. R & D

Much of what our firms do is both basic and applied research and development. Indeed, many of our firms are almost entirely engaged in R&D activities. We urge that the tax code be modified to have the R&D credit shaped more clearly to apply to the activities of industries like ours that are involved in customized production to avoid the anomaly that one of the most R&D-intensive American industries finds it

difficult to benefit fully from the tax code's R&D incentives.

America's major problem has traditionally been with the commercialization of R&D -- commercializing work we have so successfully done in applied research. Again and again we have seen other countries take the results of our research and use it in practice to beat our own industries. This country has to quit wasting $30 billion per year on basic research. Small businesses need help with something called "problem-based research." A solution we have recommended is the technical extension agent modeled after agricultural extension agents. These persons would be resource experts and coordinators to assure the U.S. learns to commercialize its R&D before other countries use our basic research to compete with us. Virtually everything our industry does is applied R&D -- the kind of practical sophistication that needs to be encouraged in American business. Steps must be taken to ensure that the tax law is targeted to encourage and support this vital activity.

VII. COMPETITION IN CONTRACTING

The 1984 Competition in Contracting Act was designed to both save the government money and help expand the opportunity for small business to participate in defense and other procurement. Some limited progress has been made. The government is already saving $3.5 billion each year as a result of increasing competition in spare parts procurement. In each case where competition replaced sole source

procurements prices dropped by an average of 1/3 and a small company in our industry usually won the job from a large prime contractor. The progress in spare parts procurement, however, has not lived up to our hopes and expectations. Although DoD annual spare parts expenditures have dropped from $22.5 billion in 1985 to $19 billion in 1987, there still exists the opportunity for billions more of savings if the remaining sole source procurements were made competitive.

We recognize that competition has been increasing in areas involving architecture, computer software and other service-type activities. We do not understand why spare parts have not been more aggressively competed. We suggested that the Committee investigate mandating the levels of competition in procurement by SIC category. Perhaps through this device we can increase the competition in spare parts procurement.

We have actively pursued simplification of federal procurement procedures. We believe that the 1986 White House Conference on Small Business Issues recommendations should be pursued.

VIII. ACCOUNTING RULES

The generally accepted accounting principles also need revision. At the present time, the procedures adversely affect three critical ratios used by financial institutions to make loan decisions. Any investment in new equipment

affects the profitability ratio, the utilization of capital ratio, and the capitalization ratios. The investment reduces working capital and lowers the current ratio which in a small company is a marginal number at best.

As previously mentioned in discussing depreciation, the cost recovery period for expensive capital equipment stretches into the future -- usually much longer than the payment period. Often the cost recovery period is longer than the useful life.

Congress can address the tax issues underlying these accounting rules. We would be pleased to assist the committee in drafting proposals for the Ways and Means Committee.

IX. SELF-HELP

Above all, we are committed to self-help as an industry to ensure that our members remain competitive. This means far greater emphasis by our companies on their own, and through industry-sponsored programs that focus on:

- o quality -- the hallmark of our business that requires the highest craftsmanship and rigorous monitoring and quality control systems;
- o productivity -- ensuring that the most efficient and cost-effective equipment and processes are being used;
- o service -- providing our customers with the most responsive, speediest service possible;
- o innovative management -- supporting concepts such as flexible manufacturing networks to make sure that small business endures in the world competitive market;
- o training and education -- to keep managers and technicians

continually up-to-date in a rapidly advancing technical environment; and,

- o market development -- despite increased foreign presence in our own market, increasing numbers of companies in our industry are successfully competing in foreign markets.

Our Association already has successful programs in these areas but we recognize that more must be done and we will be increasing these efforts in the year ahead.

Our members are confident that they can remain fully competitive in terms of quality and service -- and that with appropriate incentives, they can significantly narrow any cost differentials between themselves and foreign competitors. This is a proud group of American craftsmen who have been critical to our industrial might in the past and who look to continuing to play that role for America in the future. Thank you.

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Testimony of

Robert E. Friedman
President, Corporation for Enterprise Development

before the
Subcommittee on Regulation and Business Opportunities
of the
Committee on Small Business
of the
U.S. House of Representatives

September 13, 1988

Chairman Wyden, Members of the Committee:

I want to thank you for holding these hearings on flexible production networks. I consider your attention to this important phenomenon and its potential -- and your role in bringing it to the attention of the nation -- an important act of economic leadership.

My name is Robert Friedman, and I am President of the Corporation for Enterprise Development (CfED), a national not-for-profit economic development policy research, design and demonstration organization. For nearly ten years now CfED has been working with state and community leaders to develop new and more effective tools for taking control of their economic destinies. During this time of unparalleled program and policy innovation, no idea has shown as much promise, or attracted such immediate interest as the flexible production networks that have emerged in Italy, Denmark, Germany, Sweden and other parts of Europe, which we have been discussing today.

Previous witnesses have described these networks, and the incipient efforts underway in states across the nation to develop such networks here. In my testimony I'd like to suggest possible federal roles in supporting this application. But before doing so, I'd like to discuss some of the lessons that the European experience with networks holds for us, because, in many ways, one of the most important contributions that experience can make is to clarify how we can compete in the new global economy, the nature of the development process, and the role of small business in meeting the international challenge.

Seven Lessons

Lesson One: It is possible for entire regions to increase per capita income dramatically, and in a short period of time. The Emilia-Romagna region in Northern Italy — a state-sized region of some 4 million people — rose from seventeenth among Italy's thirty regions in per capita income to second in ten years as wages rose from 90% the Italian norm to 125%. For states like those in the Southeast with a major manufacturing endowment but with income levels that have trailed the nation for generations, for states like those in the Northwest with income traditionally above the norm but whose income growth has recently slipped, as well as for the heavy industrial states of the Midwest struggling to find ways of sustaining their standard of living, the Emilian achievement stands as a beacon of hope.

Lesson Two: The way such gains are made is by large numbers of businesses of all sizes moving up the value-added curve. In Italy, Denmark and Germany, the advent of networks has lead to the widespread adoption of new practices — within existing firms and through the creation of new ones — with respect to marketing, product design and technology, all with the effect of allowing firms to sell higher value-added products. The progress was made by building on the existing industrial base, not by the sudden infusion of some new industry, though that also has occurred. Instead, businesses constantly sought ways of expanding their markets, producing and capturing higher-margin goods, applying new technologies, new management practices, and so forth.

Lesson Three: Progress comes in small steps. American economic development practitioners are too often preoccupied with the big win — the large plant induced to locate here, the big scientific breakthrough, the big numbers of macroeconomic policy. But, as the European network regions illustrate, real progress more often comes as the cumulation of a large number of small steps.

One trigger for the networks of Emilia-Romagna came when the large firms which dominated the area let thousands of workers go in response to escalating oil prices, and an attempt to shed fixed costs and unions. The laid-off workers, seeking ways to support themselves, did what they knew how to do, selling their services back to their former employers as independent contractors, now at lower wages and without benefits. Naturally they sought ways to do better: first, they sought to diversify by seeking other markets; then they sought ways to increase profit margins — by producing higher quality goods — which in turn required them to employ some of the new technology; this in turn opened up new markets, which required new skills and new technologies, and so forth. Similarly, Japan's emergence as a world economic power can be traced not to major technological breakthroughs (after all,we invented the VCR) but to continuous and incremental improvements in products and processes.

Lesson Four: Networks enable rapid development of firms' capacity by fostering of

the flow of information among businesses. No direct technical assistance is provided to individual firms in Emilia-Romagna; instead all training, all trade and technology missions are conducted in groups: the explicit purpose may be to improve trade or technology, but the implicit purpose is to get the firms to talk to — learn from — one another. The great achievement, and dynamic element of the networks may well be this institutionalized communication. It allows all firms to learn about the latest innovation — the new market, the new technology.

Our problem in this country is probably not our best firms — they are as good or better than any in the world. Instead, it is that our general practice lags so far behind our best practice. Thus, while we can justly boast about such accomplished exporters as IBM or Cummins Engine, most small firms not only don't export, they don't even realize they are participating in a global marketplace. Thus, when the National Federation of Independent Business asked its half-million members last year to rank the problems confronting them, they ranked as 75th out of 75, exporting: it wasn't a problem because they didn't do it.

Contrast this to the firms of Emilia-Romagna where general practice comes very close to best practice where virtually every firm markets internationally, employs automated technology, manages employees as partners in the enterprise, defines its business challenge as "being the best."

We do not have the resources or the time to improve general business practice firm-by-firm, on a one-to-one basis. Networks become a way around this block by enabling firms to learn from one another, allowing government assistance, where it is necessary, to be "wholesaled" to them, rather than "retailed."

Lesson Five: Networks develop and flourish, not because of some unique cultural or historical predilection, but because they are economically successful. Some observers object that networks could never work here because American business owners are too independent and untrusting. But what really seems to power the European networks is that they improve the bottom line; entrepreneurs find they can achieve things together that they could not possibly accomplish alone. The subscription to the $5,000-a-year fashion publication that allows a knitwear firm to keep up with the latest styles, and charge higher mark-ups, is unaffordable to an individual firm, but no burden on a thousand. That networks have developed in so many different regions and nations should be proof enough of this; the fact that networks have begun to emerge spontaneously in this country for just such reasons provides just one more argument.

Lesson Six: The issue is really entrepreneurship, not size. Small businesses are often seen just as dependent derivatives of large firms, and generally as producers of low-paying jobs. The actuality of the small network firms should believe these myths.

More importantly, the networks of Europe should serve to clarify that what is important is entrepreneurship — combining resources in new ways to add value —

not the size of the enterprise. New firms most often exhibit entrepreneurship, but not always; small businesses sometimes do. Large firms can also be entrepreneurial; indeed they have to remain competitive: Hewlett-Packard now derives half its revenues from products it didn't even produce three years ago. Entrepreneurship, in this sense of adding value, occurs as well in the non-profit and governmental sectors.

Small and large firms participate in the networks of Europe. Charles Sabel, co-author of The Second Industrial Divide talks about what he calls "double convergence" — small firms banding together to add the advantages of bigness (market power, penetration, information, etc.) while large firms increasingly manage themselves as confederations of entrepreneurial units, or "partner" with smaller firms who can innovate in areas where the large firm lacks expertise.

Lesson Seven: Network regions have developed a significant new culture of widespread — blue collar — entrepreneurship. Eighty-five percent of the firm owners in the Emilia-Romagna region are former factory hands with a technical school education. Not only the firm owners, but also their employees, think entrepreneurially, in terms not only of starting their own businesses (which their employers will generally help them do, knowing how dependent the system is on constant innovation), but in suggesting better ways to make the existing firm produce. Go into a technical school in the region and ask students what they will do when they grow up and typically they will tell you, "Finish technical school, achieve mastery through apprenticeship, get a job in a small firm, start my own."

Needless to say, you don't generally get that answer in vocational schools in the U.S. today. And we still operate with the image of the entrepreneur as a white, male engineer in his mid-thirties, with an MBA starting a high-tech venture backed by venture capital. This is, of course, not an accurate description of the million Americans who will start businesses this year. More importantly, it is not an accurate description of all the Americans who could start businesses.

Remember that necessity is a power trigger for entrepreneurship. Just as unemployment and poverty provided a powerful impetus to the generation of blue collar entrepreneurs of Emilia-Romagna, so can they here if we provide the supports — cultural, financial, technical — to make the endeavor only reasonably difficult instead of impossibly heroic. It is in that context that the Self-Employment Opportunity Act, sponsored by your chair Congressman Wyden, which removes the penalties that unemployed workers who choose self-employment usually face — if only on a demonstration basis — becomes so important.

The Federal Role in Promoting Networks

As previous testimony has illustrated, the U.S. interest in stimulating the development of flexible production networks is widespread. Serious, if nascent, efforts are underway in at least 15 states as diverse as Maine, Arkansas, New Jersey, Washington, Ohio, North Carolina, Maryland, Minnesota and Iowa. Perhaps

even more significant, networks are developing spontaneously, initiated by individual firms and groups of firms that realize their futures are in each others hands. But if networks are to spread with the speed and sophistication desirable, the federal government must help.

Recommendation One: The federal government should move quickly to remove the reality and perception of antitrust prosecution for participants in networks. Legal experts seem to doubt that current antitrust legislation, regulation and administration proscribe network activities. Certainly network activities do not violate the spirit of antitrust even if they violate the letter.

Whatever the reality of the threat of antitrust prosecution, there is a widespread perception that statutes prohibit this sort of collaborative behavior. This is a real impediment to the experiments likely to emerge in the next year, and if the Congress does nothing else, it ought to move expeditiously to remove any antitrust barriers, real and perceived.

- Networks promote competition both by increasing the competitiveness of existing small firms, and by spawning new ones.

- Network, almost by definition, grow in industries with lots of small firms, and rarely combine to form even a small percentage of the industry.

- Networks represent one of the few strategies around that might save and maintain small manufacturers int he face of foreign competition and large firm sourcing strategies which seek to reduce the number of suppliers.

- Network activities embrace market information, product design, technology transfer, training and finance — not price fixing.

Appropriate legislation should clarify the intent of Congress that antitrust legislation is not meant to prohibit network activity, and should not be interpreted or applied to inhibit it. In addition, Congress should provide a mechanism whereby incipient networks can be assured specifically that they will not run the risk of prosecution, perhaps by filing a plan with the Department of Justice or the Federal Trade Commission that provides immunity from prosecution as long as the Department or Commission does not object to the plan specifically and in writing within 60 days. (The legislation should also direct the Department or the Commission to give the widest possible berth to the proposals in considering their compliance.)

Recommendation Two: The federal government should publicize flexible manufacturing networks, both as a means of clarifying the nature of the competitiveness challenge we face, and the promise of networks as an effective strategy.

But there is a reason to do more, for the federal government to take an active role in publicizing the importance and promise of networks, and encouraging widespread attempts to stimulate them. For the truth is that we begin behind: many — perhaps most — of our small manufacturing firms are competing against firms they can only dimly see, if they can see them at all — firms that are globally aware and already in our markets, firms that function with all the advantages of market intelligence, technology, market power, design competence and economies of scale and scope that networks provide. Many Americans continue with the impression that Italian goods are well-designed, but poorly built — even as the state-of-the-art Metro trains in this our capital city, are manufactured in Italy. The continuance of the trade deficit, despite the low dollar, is a dramatic measure of this competitive disadvantage. Large firms are reducing the numbers of their suppliers; observers predict that we will lose one third to one-half of our manufacturing suppliers — unless they can develop independent links to the global market place or become excellent producers.

How long can our general manufacturing practice lag behind global norms and still have a chance of catching up? Not long, I suspect. And that is the reason I think Congress and the Administration ought to actively promote, rather than simply passively allow the development of networks.

This objective may be accomplished in the process of seeking the antitrust exemption described above, but the passage of such legislation should not be buried. Publicizing the need for and the promise of networks is important if they are to spread with the required rapidity. Federal agencies should also be encouraged to spread the word.

Recommendation Three: The federal government should consider the establishment of a state matching grant program for efforts to stimulate network development.

To work, networks must ultimately be of, by and for the private sector — managed, funded and directed by the firms that must benefit from them. But small firms are not used to thinking in terms of how such networks might help them accomplish their goals. Thus it is appropriate for government to seed efforts to engage firms in consideration of establishing networks ("broker activities") and beginning actual collaborative programs ("hub activities"). Indeed, European governments have seeded network efforts there.

Of course, any provision of monies in face of the current federal deficit must come under extreme scrutiny. For this reason, any consideration of funding should be separate from pursuit of antitrust exemptions, lest it slow down that process. Nevertheless, there are at least three reasons to suggest that establishment of such a program need not create a significant drain on public expenditures:

- A matching grant program need not be large to be effective, and should only be on a seed (of limited duration) and matching basis (requiring

both state and private sector matching) thus leveraging additional resources.

- Existing economic development technical assistance funds might be earmarked for this purpose.

- Networks represent a way of privatizing business assistance services in such a way that over the long run the draw on government funds for this purpose should be lessened.

In closing, I simply want to suggest that there are things that remain to be done, but these hearings are a good start, and the Subcommittee is to be congratulated for holding them.

The National Journal Aug. 13, 88

TRADE REPORT

The Sum of the Parts

Some of the myriad small companies that supply parts for U.S. products are experimenting with high-tech, flexible manufacturing. They may win back some of the old competitive edge.

BY BRUCE STOKES

MEADVILLE, PA.—In late 1981, C&J Industries found itself in trouble. Buffeted by the recession and by growing foreign competition, the small tooling and machining company had laid off about a fourth of its employees. Like so many other small manufacturers in this Rustbelt region of northwestern Pennsylvania, management faced the prospect of closing down completely.

"An accountant told us, 'Your company is falling out of the skies like a parachutist whose chute hasn't opened.' " C&J president Harold L. Corner said.

Drastic measures were needed. In desperation, Corner scrapped his old way of doing business. He installed new computer-integrated, flexible manufacturing equipment and reformed management at all levels to make quality control the firm's No. 1 objective.

The rescue effort worked. Inches short of a crash landing, the company's parachute opened, and C&J is now floating upward. It has been transformed from a traditional, grimy, hands-on tool-and-die maker for heavy industry to a state-of-the-art, high-technology production facility that can just as easily make auto parts or medical instruments—a truly flexible manufacturing operation. And "now, by God, we can do anything better and cheaper and in a more timely fashion than the Japanese," Corner said.

C&J's saga highlights the problems and opportunities facing small American manufacturers in today's rapidly changing global economy. While the three-year decline in the value of the dollar has breathed new competitive life into America's industrial giants, the myriad small companies that supply more than half the parts used by the major auto, electronics and consumer goods producers have not been so lucky.

Most lack the financial resources and management skills to take full advantage of burgeoning new demand that is driven by the relatively lower cost of American-made products overseas. And few can keep pace with ever-greater customer requirements for better quality products and timelier deliveries.

To help small companies deal with these problems, the Commerce Department, the Pentagon and several state governments have launched a series of initiatives to encourage parts producers to modernize. These efforts include incentive contracts, training institutes and the development of networks of small companies engaged in advanced manufacturing. Large corporations such as American Telephone and Telegraph Co. (AT&T) and Ford Motor Co. have also begun to pressure their suppliers to get up to date or risk losing future business.

If this unprecedented cooperation between the government and big and small companies succeeds in seeding the American economic landscape with technologically sophisticated, micro-sized factories, industry experts say U.S. manufacturers stand a good chance of recapturing much of the parts production that was lost overseas in the early 1980s when the dollar was high.

Moreover, the competitiveness of U.S. manufacturing should improve substantially. And that improvement will appear not as often-transitory price competitiveness that comes with a favorable shift in the exchange rate, but as a fundamental improvement in basic costs, quality and responsiveness that will ensure long-term competitive success.

At the same time, however, a transformation of America's small manufacturers means that the U.S. business structure may never be the same. The cost, complexity and inherent advantages of flexible

C&J Industries president Harold L. Corner with computerized equipment
We can do anything better, cheaper and timelier than the Japanese.

manufacturing would all but ensure that there will be fewer small-parts producers in the future. And those companies that survive will be more closely allied with their principal customers than ever before, undermining the cherished American tradition of an independent small-manufacturing sector.

Still, the benefits of this transformation should far outweigh the costs, industry analysts say. That's because widespread diffusion of flexible manufacturing techniques and technologies will create small American companies that are stronger, more stable and more adaptable to changing economic conditions and thus better prepared for the 21st century.

Commerce Department productivity and innovation chief D. Bruce Merrifield
A dedicated plant unresponsive to consumer changes was no longer economical.

THE FATE OF JOB SHOPS

For most Americans, domestic manufacturing is represented by names such as Chrysler Corp., International Business Machines Corp. and AT&T; those are the nameplates people see on many products they buy. But most if not all of the parts that go into such products are made by small-parts producers.

Generally, parts manufacturing is a two-step process. First a die or a mold of a component must be made. Then the die or mold is used to mass-produce the part.

Die and mold making is a highly customized business requiring craftsmen with years of experience. The cost of one die can easily exceed $100,000, and production volume is low. "If you get an order for five dies or molds, you've died and gone to heaven," said Matthew B. Coffey, president of the National Tooling and Machining Association (NTMA), the die and mold makers' trade group. As a result, this sector of the economy has long been dominated by small companies—the largest firm in Coffey's association has only 700 employees.

Increasingly, these factories—known as job shops—not only make dies and molds, they also use them to produce parts for large manufacturers, who find it more efficient to subcontract that work than to do it themselves. The Commerce Department estimates that 40-70 per cent of all components used by prime manufacturers now come from such small producers.

The recession of the early 1980s and the rising value of the dollar hit small manufacturers particularly hard. "There was a tremendous loss of business for our industry, particularly in the Rustbelt," said Corner, a former national president of the NTMA. "Most of our industry's major customers moved offshore or to the Southwest or Southeast. It created havoc for those of us in the contract manufacturing business."

"Second and third-tier companies were not competitive with offshore production," said D. Bruce Merrifield, assistant Commerce secretary for productivity, technology and innovation. And, "a [traditional] dedicated plant [unresponsive to rapidly evolving consumer demands] was no longer economically justifiable."

Threatened with extinction, small tooling and machining companies tried desperately to automate. In 1981, an NTMA survey had found that 76 per cent of its members did not have computers and did not see the need for them. By 1987, 86 per cent used computer-controlled machine tools. While this is an impressive turnaround, the news was not all good. Only 38 per cent of those surveyed in 1987 used computer-aided design (CAD). "If 38 per cent had CAD in a world where CAD is standard, they still have a hell of a long way to go," Coffey said.

C&J Industries was a small company that automated in order to survive. Corner and a partner started the firm in a garage in Meadville in 1962, with $10,000 worth of equipment. Their principal customer was Talon Inc., the area's largest employer and the world's principal maker of zippers.

As Talon's market share was eaten into by YKK, a Taiwanese zipper maker, C&J struggled to diversify its business. But the region's economy was collapsing around it. Longtime customers were turning to producers in Japan, Mexico and South Korea, whose state-of-the-art factories and cheap labor enabled them to design and build the same product faster, cheaper and with fewer defects.

"We knew we couldn't compete with $1-an-hour labor in Korea," Corner said. Somehow, C&J had to reduce the amount of labor embodied in each of its products, while improving quality and service. To do that, Corner said, "we had to cut out all the fat, regroup and reestablish priorities."

Almost by accident, Corner discovered his parachute. He bid on a contract to make simple medical devices. Although C&J could not meet the quality requirements of the work, the customer was impressed with C&J's technical capacity. C&J could have the contract, the customer said, if Corner agreed to adopt the management philosophies of W. Edwards Deming that Japanese companies have enthusiastically embraced: precise production controls, "just-in-time" delivery (which almost eliminates the need for storage of inventory) and management accountability.

This approach permitted C&J to realize the full productive potential of the new computer-assisted manufacturing technologies—robotic machine tools, computer-assisted design linked directly to the shop floor and so forth.

Since then, C&J has been transformed. The tooling and machining company now sees itself in the plastic injection molding business. Once primarily the producer of auto parts, the company now makes everything from syringes to electrical connectors. No longer bound to a particular product, C&J now markets its capacity to provide miniaturized tooling for high-speed production of precision components and parts for the auto, electronics, computer, telephone and medical instruments industries.

In the process, all the company's production scores have improved. While delivery of a 1,000-man-hour tool, the industry's standard unit of measurement, once took 32-36 weeks and cost the customer $50,000-$60,000, delivery now

comes in half the time and at 65 per cent of the previous cost, figures comparable with those of producers in Japan. As a result, C&J was able to outbid a Japanese company for production of fuse blocks for Ford cars, bringing back to the United States production that had gone offshore.

Overall, the transformation has meant a better bottom line. After losing money for years, C&J is solidly in the black, and the company now employs about 300, up from 110 in the early 1980s.

FEW FIRMS FOLLOW

Despite the continuing distress in the small-manufacturing sector and the apparent benefits of new manufacturing techniques and technologies, few small companies have rushed to follow C&J's example.

Management problems are an important reason. "Small businesses have only a few people who manage their technologies, and those people are busy chasing their tails just to keep in business," said Robert T. Lund, professor of manufacturing engineering at Boston University. "They rarely have the time to step back and evaluate alternatives, especially major changes in their technology such as going to a computer-based manufacturing system."

Moreover, Corner said, even if a decision is made to buy new machinery, "you can't go into computer-aided manufacturing without a cultural change in management practices—a management attitude that you are not going to produce a single bad part. The chief executive officer must realize that this matter of quality can not be delegated to the quality department, much like purchasing is delegated. You must think it, breath it, live it. For if it is not in the corporate boardroom, it will not be on the factory floor."

And even when management is committed to change, financing can be a problem. A few years ago, a state-of-the-art machining and tooling operation could be started for $50,000; start-up costs now are roughly $2 million. While this wouldn't faze a *Fortune* 500 company, it can be daunting for small firms.

"The high cost of capital is one of our biggest barriers" to greater adoption of flexible manufacturing, Commerce's Merrifield said. "It's why we aren't doing any more than we are."

In addition, the NTMA's Coffey said, "when Congress took away the investment tax credit, they took away many small companies' down payment on flexible manufacturing." Merrifield agrees, pointing out that while the tax credit was in effect, it stimulated an estimated $80 billion in new automation investment.

But even when companies can afford to borrow to upgrade their equipment, many banks won't lend them the money, manufacturers say, because bank loan committees, especially in small towns, have no conception of what flexible manufacturing involves.

"The typical banker wants to see his normal equations based on hours of labor," Corner said. But flexible manufacturing greatly reduces labor costs. In addition, just-in-time delivery reduces inventory, making it look on on the bottom line as if assets are declining. And current accounting methods treat the high up-front costs of programming new machine tools as a cost, not an investment. As a result, on a balance sheet, costs look like they are out of control.

"By traditional cost accounting techniques, you often cannot justify the investment," Coffey said. It is little wonder that 70 per cent of the small manufacturers that automate now finance their automation through retained earnings.

Tooling trade group's Matthew B. Coffey
Bemoans loss of the investment tax credit

Solving these financial problems will be no easy task. The Commerce Department is working with major accounting firms to come up with new accounting standards more attuned to modern technology. Merrifield would like to see a narrowly focused investment tax credit for productivity improvements such as automation. And Coffey also supports "incentives to help small guys do things."

But accounting revisions will take years. And, in today's era of tight budgets, few observers hold out much hope for government financial assistance for small-company automation. Moreover, the disaggregated nature of the problem, scattered among thousands of small firms, raises doubts about the efficacy of a centralized government response. So federal and state governments and the business community are focusing their efforts on cooperative hands-on training programs for small manufacturers and shared manufacturing facilities to encourage firms to adopt flexible manufacturing technology.

One of the first of these efforts to get off the ground will be the National Institute of Flexible Manufacturing, scheduled to open here by the fall of 1989. The institute was conceived by the Commerce Department's office of productivity, technology and innovation. C&J's Corner, the Meadville Chamber of Commerce and representatives of local industries heard of the plan and immediately picked up on it.

The institute will consist of a nonprofit teaching arm and a for-profit production unit. The production unit will be owned by a private nonprofit corporation run by representatives of local industry and government. Companies interested in flexible manufacturing but leery of taking the plunge will be able to first train their managers and workers on the institute's state-of-the-art equipment before deciding whether to install the technology in their own plants.

Local companies will also be able to test-produce products at the facility or permanently contract with it to perform certain phases of their production. In this way, small companies can ease into flexible manufacturing or make use of it whenever it makes sense for them. Finally, as one of its services, the institute will provide quality testing for companies that cannot afford testing equipment.

"The institute reflects our needs," Corner said. "We do not have a community college or graduate engineering school within 100 miles, so continuing education poses a very serious problem."

Moreover, local officials vividly remember the 18 per cent unemployment rate that plagued their region just a few years ago (local joblessness currently now stands at 8.2 per cent). "The window of opportunity is closing very rapidly," warned Martha Miller, executive vice president of the Meadville Chamber of Commerce. "Unless we can learn to compete on a dollar-for-dollar basis with foreign producers, [the loss of small-manufacturing jobs] could happen all over again for us."

That fear lends a sense of urgency to the Meadville institute's work. It has already begun to hire staff, and in February it began a series of orientation classes for

local company executives, middle management and plant managers.

Finding a plant site is the next step. Fund raising has already begun. Pennsylvania has contributed $375,000, with more likely to come over the next two years. The federal Economic Development Administration has kicked in $66,000, and foundations are being approached for matching support. In addition, local companies will be asked to commit to buying future services or production time.

With the need to raise $3 million-$5 million in start-up funds and a projected $15 million-$25 million annual budget, "there is always the chance the institute could fall through or might be smaller than what we envision or what is needed," Miller said. But, so far, the local response has been encouraging.

"It is the only instance in the country that I am aware of where private companies have committed themselves like this," said Jacques Koppel, director of Pennsylvania's office of technology development, which is helping bankroll the institute's start-up. This private-sector involvement makes the Meadville experiment unique.

Martha Miller of the Meadville Chamber of Commerce
We risk losing small-manufacturing jobs to foreigners.

NATIONAL EFFORTS

But other efforts are under way. The National Bureau of Standards has an automated manufacturing research facility in the Washington area that is developing communication protocols to allow all machine tools to work together. This will be particularly helpful to small companies that cannot afford to have incompatible equipment.

Sen. Ernest F. Hollings, D-S.C., was instrumental in getting $5 million appropriated for two regional centers for the transfer of manufacturing technology. Ten more of these primarily educational centers were authorized in the recently passed omnibus trade bill.

The Defense Department, through its manufacturing technology program and other efforts, encourages the development and use of innovative production technologies. *(See NJ, 7/30/88, p. 1968.)*

And in addition to the Meadville institute, Merrifield's office is also working with business leaders and educators in various states to create somewhat-less-ambitious shared flexible manufacturing facilities. Marshall University in Huntington, W.Va., for example, is planning to set up a "teaching factory of the future" on its campus for use by small local companies. And Boise State University in Idaho hopes to create an on-campus shared flexible manufacturing facility, where companies can learn, make prototypes and execute limited production runs.

For their part, private companies that sell flexible manufacturing equipment are attempting to spur automation among small manufacturers. For example, to reassure banks that loans for flexible manufacturing equipment are safe, the Van Dorn Co. of Cleveland has guaranteed that it will buy back recently purchased production equipment from its customers if they can't make a go of it.

Despite all the promotional activity, however, advocates of flexible manufacturing emphasize that it will be no easy task to persuade small job shops to adopt advanced manufacturing techniques. "Like an alcoholic," Corner said, "companies may have to hit the streets, feel the loss of market share, the loss of profits, the public ridicule" before they will be ready to act.

And that may not happen soon. The recent fall in the value of the dollar, which has made American small manufacturers more competitive internationally without their having lifted a finger, may be sending dangerous signals to small producers, lulling them into a false sense of complacency about their long-term prospects, analysts say.

Even if companies modernize and establish cooperative training and shared production facilities, problems remain. For example, it may be difficult to get small, hitherto fiercely independent firms to work together amicably. And, if they do, there are antitrust questions.

In fact, to identify some of these regulatory barriers to flexible manufacturing, Rep. Ron Wyden, D-Ore., has scheduled a Sept. 13 hearing of his Small Business Subcommittee on Regulation and Business Opportunities.

Finally, federal financing will continue to be an obstacle. Reagan Administration officials say there is no need for a major new federal program to support new technology—Merrifield's office spends about a quarter of a million dollars solely in staff time promoting its small-business flexible manufacturing effort. But if money markets fail to deliver and banks continue their reluctance to lend, the funds for modernization have to come from somewhere.

The private business sector might be a source. In Japan, major companies often finance their subcontractors' automation. American manufacturers "are beginning to look at this as a way to help their suppliers become world-class producers," said Ted Lettes, director of the Commerce Department's flexible computer-integrated manufacturing initiative. But industry analysts point out that this would only accelerate the recent trend in the U.S. economy toward fewer and larger parts manufacturers who, more than ever, are closely tied to their customers.

Of course, in a survival-of-the-fittest, truly free market, nothing would need to be done to help small companies modernize. Those that didn't would simply die off.

The economic and national security costs of such a process, however, would be high. Without a strong base of parts suppliers within the U.S. economy, major manufacturers that had already shifted production offshore because of the high dollar may be reluctant to return, negating some of the touted trade benefits of a cheaper dollar. High-paid American manufacturing jobs would continue to disappear. The tool-and-die-making skills essential to an industrial economy would wither away. The small towns where many parts producers are located would continue to decline. And the innovation that flows from an entrepreneurial small-manufacturing environment may dry up.

The United States cannot let that happen, C&J Industries' Corner said. "We have to deal with this problem. We have to salvage the manufacturing base of this country."

Congressional Research Service
The Library of Congress

Washington, D.C. 20540

July 20, 1988

TO : House Committee on Small Business
Attention: Steve Jenning

FROM : American Law Division

SUBJECT : Flexible Manufacturing Networks: Some Possible Models/Precedents for Legislative Action

You have requested that we review the materials concerning flexible manufacturing networks provided by you in order to determine whether (1) the concept of "flexible manufacturing networks" (or "flexible manufacturing plans")[1] as presented therein, might violate the existing federal antitrust laws; and (2) there may be legislative solutions to obviate any problem of possible antitrust violations. The following memorandum attempts to address those questions.

Background

Section 1 of the Sherman Act[2] prohibits contracts, combinations or conspiracies in restraint of trade; Section 2 of the same Act[3] prohibits both monopolization of markets and attempts to monopolize; Section 7 of the Clayton Act[4] prohibits the acquisition of assets or stock of a company engaged in or affecting interstate commerce by another company engaged in or affecting

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[1] Flexible manufacturing plans, which have been operational in Europe for several years, have been instituted in order to be able to take advantage of the often-unique capabilities of small businesses -- businesses which either were not flourishing as completely independent entities or which could not have survived absent the flexible manufacturing approach.

[2] 15 U.S.C. §1.

[3] 15 U.S.C. §2.

[4] 15 U.S.C. §18.

commerce if "the effect of such acquisition may be substantially to lessen competition, or to tend to create a monopoly." All of those statutes have been used, either singly or in combination, to challenge several varieties of activities involving joint activity alleged to have caused injury to competition and the competitive marketplace. The judicial treatment of joint activity has tended to depend either upon the specific activity being challenged or the particular antitrust provision said to have been violated. For example, the joint setting of prices (or joint activity tending to have an effect on prices) has long been condemned as a per se (automatic) violation of Section 1.[5] Traditional joint venture activity, too, has been scrutinized under the antitrust laws, particularly the Clayton Act provision prohibiting

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[5] Per se violations are those for which there can be no justification: "because of their pernicious effect on competition and lack of any redeeming virtue [they are] conclusively presumed to be unreasonable and therefore illegal without elaborate inquiry as to the precise harm they have caused or the business excuse for their use." Northern Pac. R. Co. v. United States, 356 U.S. 1, 5. "Rule of reason" inquiries, on the other hand, require the balancing of the competitive harm against the competitive good likely to be caused by the arrangement in question. The leading case generally credited with establishing the concept of the rule of reason is Standard Oil Co. v. United States, 221 U.S. 1 (1911).

Cf., e.g., United States v. Trenton Potteries Co., 273 U.S. 392 (1927), which established price fixing as a per se antitrust offense (direct price-fixing); Northern Pacific R. Co. v. United States, supra; National Society of Professional Engineers v. United States, 435 U.S. 679 (1978) (professional society's canons of ethics prohibiting the discussion of price with prospective clients constituted price fixing). Compare, Broadcast Music, Inc. v. Columbia Broadcasting System, 441 U.S. 1 (1979), in which the Court found that there was no per se price-fixing violation by a group of copyright holders who had formed a joint venture to market their compositions by means of blanket license agreements, even though "the blanket license involve[d] 'price fixing' in the literal sense" (441 U.S. at 8); Business Electronics Corp. v. Sharp Electronics Corp., ____ U.S. ____ (Doc. No. 85-1910, May 2, 1988), a resale price maintenance (or vertical price-fixing) case in which the Court refused to find a per se price-fixing violation in the decision by a supplier to cease dealing with a "discount" retailer in favor of a generally "full price" retailer.

merger transactions.[6]

Pursuant to a flexible manufacturing network, a consortium of small businesses, normally competitors, engages in a common enterprise while maintaining the individual identities of the separate businesses, the rationale for that arrangement being that such a consortium is better able to respond quickly to the changing requirements of customers for manufactured output than is an individual entity. You are especially interested in the concept as a possible means of enabling United States' industrial entities to compete successfully in the international marketplace; a flexible manufacturing operation might, as well, it has been asserted, be a way in which U.S. business entities may either be established or continue to operate profitably.

Models/Precedents for Antitrust Immunization of Flexible Manufacturing Networks

Flexible manufacturing entities seem most to resemble newspaper joint operating arrangements (JOAs). Pursuant to a JOA, two otherwise competing newspapers share composition (printing, etc.) and marketing facilities (in other words, general business operations) and expenses while maintaining their separate editorial identities. Traditionally, JOAs have been utilized by financially ailing newspapers in order to reduce their expenses.

In 1965, the United States brought suit against the only two daily newspapers in Tucson, Arizona, charging that their JOA, in effect since 1940, and which eliminated all commercial competition between them, violated the antitrust-law prohibitions against unreasonable restraints of trade and

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[6] Cf., United States v. Penn-Olin Co., 378 U.S. 158 (1964), the leading (and only) case dealing specifically with the legality of a joint venture under the antitrust laws.

monopolization.[7] The Supreme Court agreed, in part because it was not persuaded that the requirements of the judicially created "failing company defense" had been met.[8]

Congress' response to Citizen Publishing was the Newspaper Preservation Act,[9] which effectively overruled that decision and created a limited antitrust exemption for certain newspaper JOAs. In addition to sanctioning many JOAs established prior to enactment of the Newspaper Preservation Act, 15 U.S.C. §1803 provides for the creation of new newspaper JOAs if they apply for and receive the "written consent of the Attorney General ... [who] shall determine that not more than one of the newspaper publications involved in the arrangement is a publication other than a failing newspaper, and that approval of such arrangement would effectuate the policy and purpose of" the Act.[10]

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[7] According to the government complaint, the newspapers' joint setting of advertising and subscription rates and their arrangement concerning the pooling of profits constituted a price-fixing violation of Section 1 of the Sherman Act; and the JOA prohibition on competing business activity by the papers, their stockholders, officers, or executives foreclosed the possibility of a competing publishing operation, amounting to unlawful market control, or a monopolization violation of Section 2.

[8] Citizen Publishing Co. v. United States, 394 U.S. 131, 136-9 (1969). The "failing company" doctrine has permitted the courts to sanction a merger or acquisition transaction that normally would have been found to violate the Clayton Act's prohibition against mergers or acquisitions that might tend to lessen competition (15 U.S.C. §18), if there is sufficient evidence to persuade a trier of fact that absent the merger, one of the companies would cease to be a competitive force in the market; the "failing company" doctrine thus allows otherwise anticompetitive mergers to take place on the theory that no competition is being eliminated as a result of the transaction. The district court in Citizen found, and the Supreme Court agreed, that there was no evidence tending to show that "Citizen Publishing was ... on the verge of going out of business, nor was there a serious probability at that time that Citizen Publishing would liquidate its assets unless [it] entered into the operating agreement." Id. at 137, quoting 280 F.Supp. at 980.

[9] 15 U.S.C. §§1801-1804.

[10] 15 U.S.C. §1803(b).

Although the immediate impetus for the Newspaper Preservation Act was Congressional concern for the increasing number of single-newspaper cities -- the desire to maintain the editorial voices of newspapers that could not have survived if forced to "go it alone," the more general rationale behind the Act -- a desire to maintain an asset whose existence was seen to be endangered by the antitrust laws, would seem to be applicable as well to the current form of joint operating agreements known as flexible manufacturing plans.

It is not necessary to presume that the affected businesses would probably cease to exist absent legislation to permit their participation in flexible manufacturing plans, or that they represent "distressed" industries, in order to believe that the economic health of the Nation would be significantly enhanced if flexible manufacturing arrangements were statutorily authorized or approved. The Newspaper Preservation Act is a model for legislation addressing the antitrust status of flexible manufacturing arrangements, but that Act need not be specifically cited, nor need the fact that it is, in effect, a codification of the "failing company" doctrine be considered as creating a necessarily negative perception of any current legislation based on it. Legislation to authorize flexible manufacturing arrangements might, for example, emphasize the positive economic and societal aspects of such plans (a) in the "Findings" section of the legislation itself, (b) in any discussion of the proposed legislation, or (c) in a report to accompany the legislation; there is no reason for any negative implications to be drawn from the fact that the Newspaper Preservation Act has served as a model for the genre.

Two other types of situations, both of which have been addressed in recent legislation, also come to mind. Legislation to immunize flexible

manufacturing networks from the operation of the antitrust laws might be based on the Export Trading Company Act of 1982,[11] in which Congress finds, inter alia, that "United States exports are responsible for creating and maintaining one out of every nine manufacturing jobs in the United States and for generating one out of every seven dollars of total United States goods produced"; "tens of thousands of small- and medium-sized United States businesses produce exportable goods or services but do not engage in exporting"; and "the development of export trading companies in the United States has been hampered by business attitudes and by Government regulations."[12] Pursuant to 15 U.S.C. §4013, export trade certificates of review may be applied for and shall be granted to "any applicant" which meets certain criteria, primarily representations that the contemplated activity will not adversely affect the prices of goods or services within the United States, nor constitute unfair competition against others engaged in export activity, nor result in the resale within the United States of those goods or services covered in the certificate of review.

The holder of a valid certificate of review may not be prosecuted either civilly or criminally under the antitrust laws on account of any "conduct which is specified in, and complies with the terms of" the certificate; and he is liable to private parties who may suffer injury as a result of such conduct only for actual damages rather than the traditional antitrust treble-damage award.[13]

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[11] P.L. 97-290, 15 U.S.C. §§4001 et seq.

[12] 15 U.S.C. §§4001(a)(1), 4001(a)(4), 4001(a)(8).

[13] 15 U.S.C. §4016. The Export Trading Company Act thus differs from the Cooperative Research Act in that the latter conditions its grant of antitrust immunity (limited to a damage "safe harbor") only on notification to the

A flexible manufacturing entity, which is comprised of a conglomeration of small business firms, may also be compared to the creature known in antitrust law as a joint venture,[14] realizing, or course, that a flexible manufacturing network differs from a traditional joint venture in that it permits the components to maintain their separate identities. Joint ventures need not, merely by virtue of their combined activities, be treated as per se violations of the antitrust laws;[15] in fact, joint venture activity is not inevitably subject to antitrust challenge of any kind. Nevertheless, the (mis)perception concerning the automatic antitrust liability of joint ventures has persisted -- probably because the antitrust laws do prohibit "contracts and combinations in restraint of trade"; and because there have been some cases holding both that the antitrust laws apply to joint ventures[16] and that certain joint operating agreements are per se violations of Section 1 of the Sherman Act and also violate the proscription against monopolization contained in Section 2 of the Sherman Act.[17]

That (mis)perception was among the factors considered by the 98th

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Attorney General of the proposed joint activity.

[14] Joint ventures traditionally involve a new entity established by two or more existing entities for the purpose of carrying out some finite activit(y)(ies) that, for some reason, neither parent entity is able or desires to carry out alone. They are differentiated from mergers in that the parent firms remain as separate entities, and are not subsumed in the new organization. Nevertheless, their validity is generally analyzed under and measured against the criteria of Section 7 of the Clayton Act (15 U.S.C. §18), the so-called "anti-merger" section.

[15] The Antitrust Division of the Department of Justice has never challenged a joint venture with an allegation of per se antitrust illegality.

[16] United States v. Penn-Olin Co., supra, note 6.

[17] Citizen Publishing Co. v. United States, 394 U.S. 131 (1969). See also, notes 2-4, supra, and accompanying text.

Congress in deciding to enact the "National Cooperative Research and Development Act of 1984" (P.L. 98-462, 15 U.S.C. §§4301-4305), which specifies that research joint ventures shall not be considered as per se violations, and affords certain research joint ventures limited immunity from the damage provisions of the antitrust laws on the condition that they notify the Department of Justice and the Federal Trade Commission of their planned activities.[18] Former Assistant Attorney General William Baxter, in testimony before the Senate Judiciary Committee on S. 1841 (the bill which became P.L. 98-462), stated:

> It is difficult to overstate the importance of new technology in today's economy. ... New technology increases the quantity, quality, and variety of goods and services available to satisfy the needs of consumers. ... By increasing efficiency and reducing costs, advances in technology increase productivity and reduce inflationary pressures.
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> There is a perception, however, that the antitrust laws discourage joint R&D efforts, regardless of their benefits. There is virtually no case law dealing directly with the relationship between the antitrust laws and joint R&D. There are, however, a few older decisions that can be read as condemning, more or less out of hand, non-R&D joint ventures between competitors. This and the fact that treble damages are automatic in antitrust cases have led to conservative antitrust advice and decision-making with respect to joint R&D.[19]

The Antitrust Division has on numerous occasions indicated the criteria it considers in deciding whether to challenge a joint venture as a "rule of reason" violation of the antitrust laws. Underlying the Division's examination of all joint venture activity is the belief, codified in the antitrust laws,

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[18] In addition to the statutory clarification that research joint ventures are to be analyzed under the rule of reason, protected venturers are liable, in the event their actions "within the scope of a notification" cause injury to private parties or to states, for only actual and not treble damages. 15 U.S.C. §§4302, 4303.

[19] October 26, 1983.

that competition among firms produces the greatest economic good, both for the market in general and individual firms specifically. Moreover, it is generally accepted that competition among firms is most likely to produce beneficial innovation. Nevertheless, even the Division recognizes that

> there are, of course, situations where cooperation among firms is desirable. Joint research may offer efficiency: lower cost and, through sharing complementary strengths, better results. Moreover, there are times when the alternative to joint research is no research, or research by one firm at a more meager pace. While we continue to believe that independent research in a competitive environment is the best strategy for promoting innovation, there is ample room for joint research.[20]

In November, 1980 the Division issued its "Antitrust Guide Concerning Research Joint Ventures," which set out its policies:

> The legality of a research joint venture depends on the nature of the proposed research, the joint venturers, the industry and the restraints on conduct imposed in connection with the project. In general, the closer the joint activity is to the basic research end of the research spectrum -- i.e., the farther removed it is from substantial market effects and developmental issues -- the more likely it is to be acceptable under the antitrust laws. Also, the greater the number of actual and potential competitors in an industry, the more likely that a joint research project will not unreasonably restrain competition. And, the narrower the field of joint activity and the more limited the collateral restraints involved, the greater the changes that the project will not offend the antitrust laws.
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> ... Finally, limitations on access to participation in joint research or to the fruits of that research may present antitrust problems if the effect of those limitations is to create or abuse market power in the hands of the joint venturers.[21]

Although the Division's comments have been directed specifically at research joint ventures, the principles contained within them could apply as

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[20] Ky P. Ewing, Jr. "Innovation American-Style: Competition and Cooperation in the Search for a 'Better Mousetrap'," Speech presented to the Industrial Research Institute, October 22, 1980.

[21] At 3,4.

well to production or marketing joint ventures. And the comments of former Assistant Attorney General Baxter pertaining to research joint ventures, which were of necessity limited to that genre because they were contained within testimony on S. 1841, could, as well, be applicable to joint ventures generally. It would seem, therefore, that a statute (1) narrowly enough drawn so as to include only those joint agreements which could be designated as "flexible manufacturing networks,"[22] excluding all other types of joint manufacturing or marketing ventures[23]; and (2) prefaced by Congressional findings that expressed the need for legislation to (a) clarify the antitrust status of flexible manufacturing plans and (b) encourage the formation of such ventures, should not be unfavorably received.[24]

There is, as the foregoing material indicates, ample precedent for Congressional protection from the antitrust laws of activities and entities

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[22] "Joint research and development venture" is defined narrowly in the Cooperative Research Act so as to exclude all but the desired entities. 15 U.S.C. §4301(b).

[23] The difference between joint manufacturing or marketing ventures generally, and flexible manufacturing plans/arrangements being that while the former involve one or more entities which have pooled their resources in order to form a third entity for the purpose of achieving some common goal, the latter comprise several entities which retain their independence but which work together as a "unit" for certain purposes.

[24] In Penn-Olin, supra, note 6, the Court noted that the primary problem presented by joint ventures, as with mergers generally, is the "anticompetitive danger" they pose. A joint venture "is the chosen competitive instrument of two or more corporations previously acting independently and usually competitively with one another. The result is a 'triumvirate of associated corporations.' If the parent companies are in competition, or might compete absent the joint venture, it may be assumed that neither will compete with the progeny in its line of commerce." 378 U.S. at 169. If no such danger arises from the creation or operation of a joint operation such as a flexible manufacturing arrangement, the reasoning of Penn-Olin would suggest that a court would not find the arrangement to have violated the antitrust laws.

Congress deems essential or valuable. Moreover, there would seem to be some very specific models on which to base a statute to permit the form of joint activity known as "flexible manufacturing networks."

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